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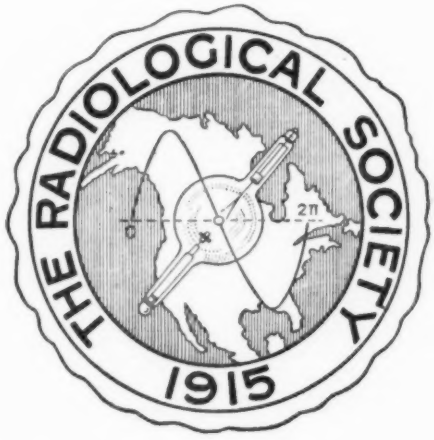
VOL. III JANUARY, 1922 No. 1



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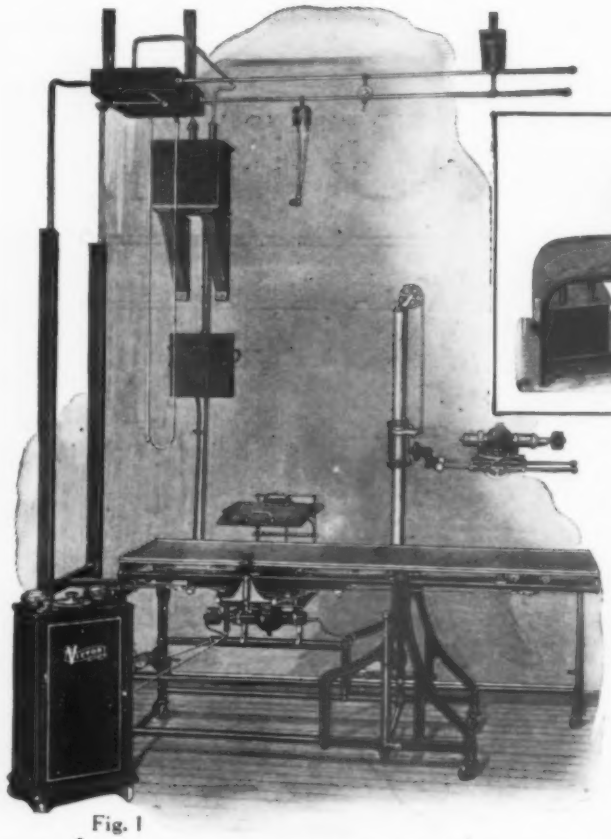

Fig. 1

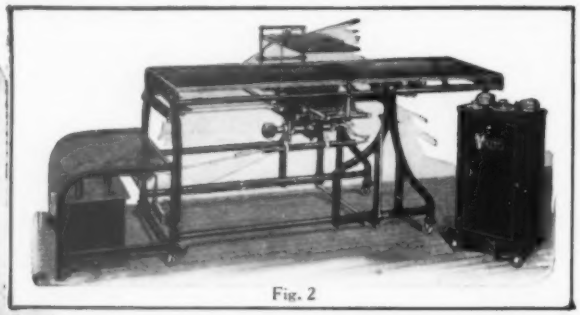

Fig. 2

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Further Observations and Clinical Findings in Roentgenography of the Chest

W. WALTER WASSON, M. D. and JAMES J. WARING, M. D.
Denver, Colorado

AT the last annual meeting of this Society, I presented for your consideration certain observations which I had made concerning chest roentgenography. In this paper, I wish to briefly describe certain additional points in this technique, and the results of their application. I shall confine my remarks to the early pulmonary disease.

Let us consider again the time factor—that all-important factor which we have all been striving to master. On fluoroscopic examination we observe that the patient is able to suspend the movement of the diaphragm, the ribs and muscular structure at will, but the heart continues gayly on. On closer inspection, we see that with each systole the lung adjacent to the heart moves toward the heart area. On diastole the same lung structure moves away from the heart. We can also see that this movement is plainly transmitted for two or three inches in a wide area around the heart, and less plainly for a still greater distance. Especially is this true where there is or has been disease in this region. This systole and diastole consumes at the most not over one-half second each.

Also, we see that a bronchus near the heart moves in a path whose width equals from one and one-fourth to two times the width of the bronchus. This movement is completed in the same time as the heart completes its cycle. In other words, in one-half second the heart moves in systole and the bronchus moves one-half its width towards the heart. A picture taken in one-fourth second would portray this bronchus moving one-fourth its width; one-eighth second exposure would portray the bronchus moving one-eighth its width. These figures are approximately correct, as the heart nearly always beats faster than one cycle per second, while the bronchus may move a less distance.

Studying the chest still further under the screen, we can see minute tubercules, and other localized areas of disease traversing similar paths to the bronchus. The movement from the auricle is rather imperceptible, but that from the aorta and great vessels (arterial pulse) is quite evident, and opposite in time to the ventricle movement. It thus produces a rocking motion of the lung. Turning to the peripheral lung fields, we see no movement, but on post mortem, we find a jelly-like mass here which must respond to vibration.

This is all involuntary movement. To this must be added the voluntary movement of our dyspneic patients and the children. In fact, a stethoscope placed over the trachea will show a slow escape of air, even in those patients whose respiration seems to have been suspended. Also the vibration of our patients and apparatus is at times considerable.

If we were to photograph a moving object with a camera, we must do so with a lens so fast that all motion is stopped. In a like manner in chest roentgenography, we see from the calculations that our time must be one-tenth second or less. This exposure I find to be very practical at the present time, and with the proper balancing of voltage and milliamperes to lose none of the contrast and richness.

The tube is another very important factor with two points of interest, stability and the focal spot. Needless to say, in an exposure of so short a time we must have a tube stable enough to give us the current desired at the proper time. The focal spot of this tube is the lens of our camera. The size of this spot indicates to us its ability to focus the rays upon a certain density.

If we have a very fine point of focus, we will find that an object five inches from the plate is sharply outlined when the anode is twenty-eight inches from the plate. A broad focus tube would need to be nearly forty inches from the plate to sharply outline this same object. This explains why some roentgenologists have their tube from thirty-six to sixty inches from the plate and obtain better results. But this greater distance means considerable loss in power and quality of the rays. This in turn calls for a longer exposure, more current and a greater strain upon the tube. We then have a vicious circle. It was to overcome this vicious circle and reach some compromise that I began the measurements of chests. Of one hundred sixty-five chest cases coming into the office in which we measured the anterior posterior diameter, we found this diameter to range from five and one-fourth to eleven and one-half inches. The greatest number of cases was twenty-one at eight inches. That portion of the anterior posterior diameter from the posterior surface of the lung through to the anterior surface of the chest wall we called the focal depth of the lung. This focal depth of a patient measuring eight inches in

the anterior posterior diameter averaged seven inches. To this must be added another inch for the distance of the patient from the film. In other words, the problem is to bring a lung measuring eight inches at its furthest point from the film into sharp relief on the finished film. But the sharpest focus tube which I have been able to purchase in the market will only focus an object five or six inches from the film at twenty-eight to thirty inches. Then there is still two inches of the posterior lung out of focus, and in all cases with a still greater anterior posterior diameter there is still a greater amount of the lung out of focus. The focusing rather than so much tissue to penetrate, seems to explain why we get blurring and an indistinct film in thick people. We have an aid in stereoscopic plates whereby we can see the anterior and posterior parts of the lung.

With these points in mind, we can work out our technique to cover the entire lung field. To increase the distance too far at the expense of our time factor is inadvisable, and it seems best at present to compromise. With our very fine focus tubes we can cover the majority of our cases at twenty-nine to thirty inches, and then in our large chests take them on their backs for study of the posterior lung fields. This enables us to work at one-tenth second or less with no unusual wear upon the tube.

In the application of these observations let us study our finished film and see our results. The heart and its vessels we find in sharp outline so that we may observe any gross lesion. The hilus and portions of the mediastinum show any fibrous or glandular change without confluence of shadows. Study can then be made of any infiltration of hilus glands and spread of infection to the adjacent lung.

The bronchi passing out from the hili are seen with sufficient clearness so that we may make a study of the bronchial walls and adjacent lymphatics and vessels. In the peri-bronchial thickening of tuberculosis the bronchi show that sharp fibrous outline with beading so characteristic of that disease. The sharpness of outline often indicates the degree of chronicity. In chronic bronchitis

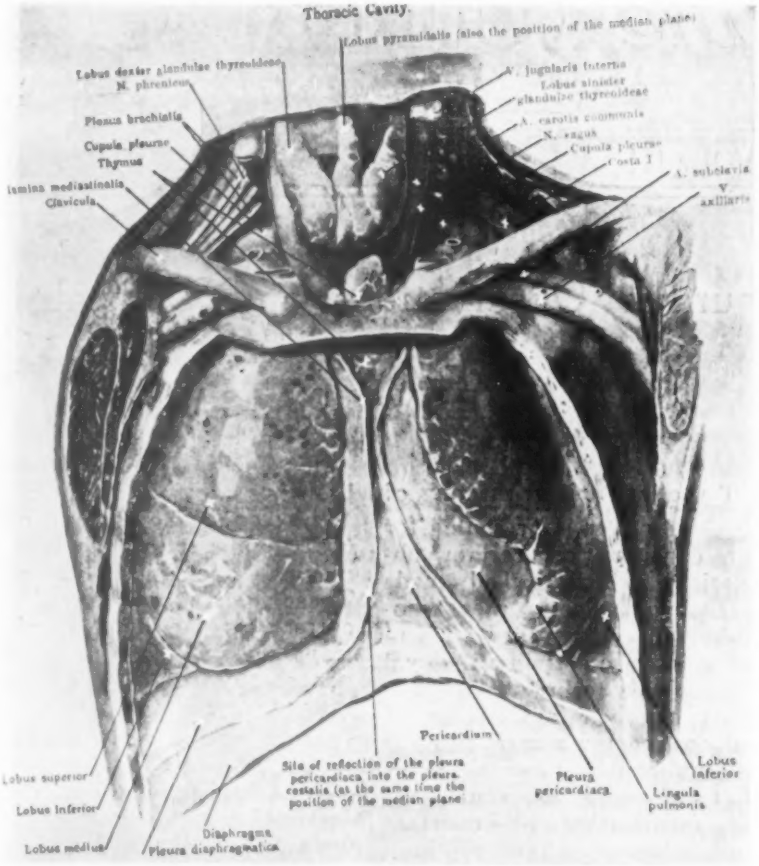


Figure I.—Reproduction from Spalteholz Anatomy showing close relationship of the thoracic viscera.

the bronchial walls are thickened, while in the purulent form, they are not only thickened, but have hazy, fuzzy outlines, indicating congestion and involvement of adjacent structures. This is also true of the bronchiectatic form, with the addition of localized pockets and dilatations in the bronchial lumena. This enables us to diagnose our bronchiectatic cases quite early, perhaps in the

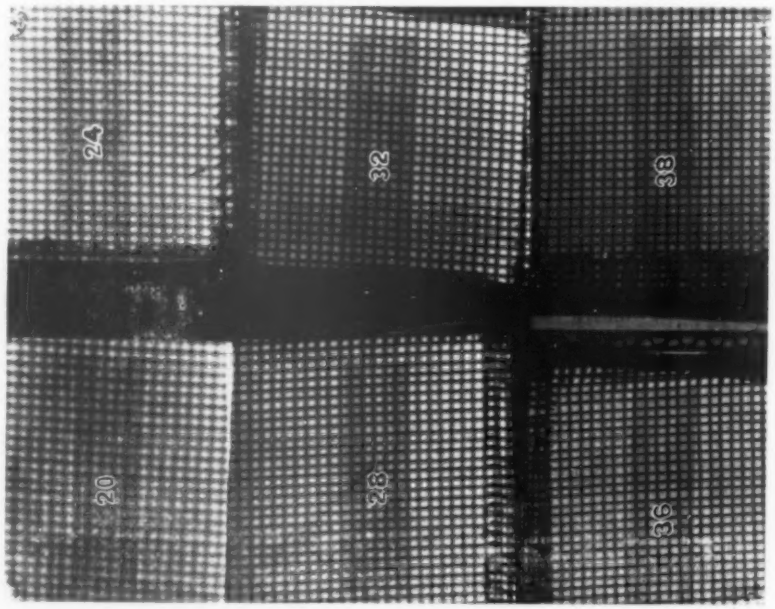


Figure II.—Target test with wire screen five inches from plate and the anode of tube at distance indicated. It will be observed with the anode twenty inches from the plate the image is completely blurred, while with the anode thirty-eight inches from plate the image is well defined.

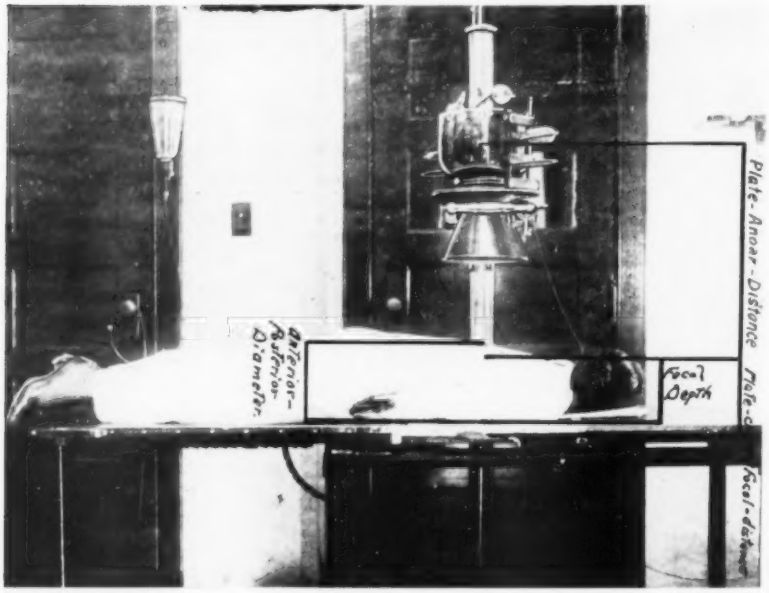


Figure III.—Photograph of table, patient, and tube illustrating the principles involved in the plate-anode-distance.

future before the dilatation has actually occurred. Still we have many who insist that the roentgenogram has very little value in bronchiectasis and only shows hazy, indefinite bronchial shadows!

Tracing the bronchi towards the periphery we find that we have a very clear view of them down to the small bronchioles in even the normal lung. It is then possible to study any change from the normal in these small bronchioles and in the secondary lobules. The first change that we observe is a broadening of these shadows with perhaps some beading scattered through its mesh and this lymphatic engorgement which has been found by Miller and others to be along the bronchi and septa about the lobules may extend to the hilus. In the next stage the small beading becomes more and more confluent until we have a small patch indicating air cell congestion, and if this patch becomes sufficiently large it will give signs which may be detected by the stethoscope. This air cell congestion is pathognomonic of activity and is to the roentgenologist the same as the rale to the internist. The earlier changes are not infallible. This description is characteristic of some chronic infection, notably tuberculosis, rather than some very acute process where a whole lobe is overwhelmed in a few hours. In an advanced case of tuberculosis, we can find similar areas where the process is just making its beginning.

To make the statement that there is interweaving of the terminal bronchi is insufficient, as we may have this as an extension from the hilum in bronchiectasis. In cardiac diseases, dust and chemical inhalation, chronic pneumonitis and tumerous growths, we have similar processes to differentiate. Here, however, the general picture will usually give the key to the diagnosis.

Our final consideration is the value, if any, of this minute study of the lung structure to the internist. I have asked Doctor

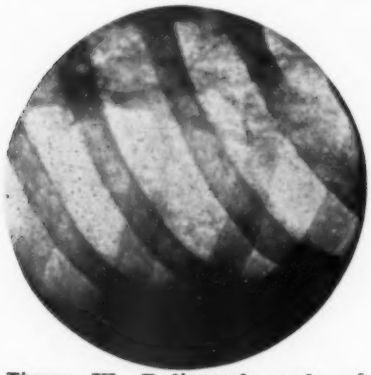


Figure IV.—Radiograph made of lung, post-mortem, inflated to full capacity and not injected. This specimen was obtained from a suicide who had cut his throat, so there was no post-mortem stasis of blood in lung tissue. Observe the minute ramification of bronchi and the general parenchymal structure.

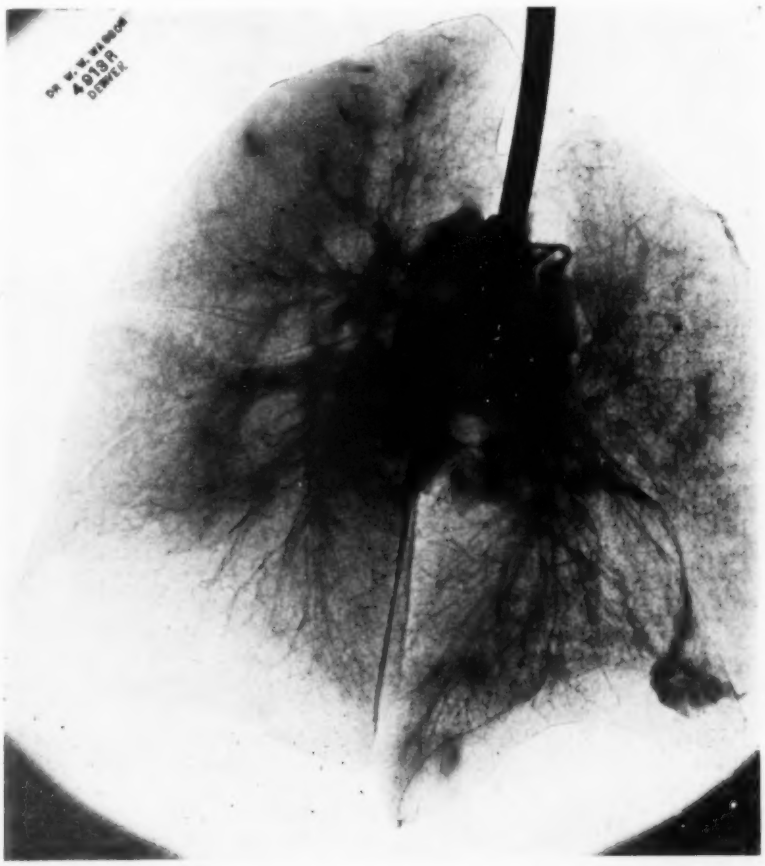


Figure V.—Same as figure IV in which barium was traced on the connective tissue marking off the lung lobules on the pleura. At A. These lobules are farther from the plate and while shown are not clearly outlined. At P. These same areas are well defined.

James J. Waring of Denver, who is ably informed in these matters, to give you a summary of the internist's viewpoint. He states as follows:

Barjon says, "If the radiologist ought to be a physician, it would be well also for the physician to be, in a less degree, a radiologist." This is particularly true if the physician be a specialist on diseases of the chest.

A few years ago, radiography of the lungs was experimental. Today it is fundamental to a complete examination of the chest; and indeed, in doubtful cases it is the wise physician who refuses an opinion without the additional evidence of a study of stereoscopic plates. If it is important that the physician should have long training and experience in the technique of physical examination, that is, in the technique of inspection, palpation, percussion and auscultation, it is more than equally necessary that the roentgenologist should have special training in the particular technique of radiography of the same portion of the body.

A tolerably good picture of the lungs in suspected pulmonary disease is worth no more than a tolerably good physical examination. The greatest field of usefulness of the x-ray in the diagnosis of pleuro-pulmonary affections lies in the differentiations of borderline conditions, among which stands preeminently tuberculosis. Early pathology may be recognized with certainty, early etiology with vastly less certainty. The greatest value of the revelation of early pathology by the x-ray consists in this, that it frequently confirms and establishes the tentative clinical diagnosis.

In even the best plates interpretation is difficult, sometimes impossible. Positive statements as to the origin of certain shadows may be unwise, and frequently may lead astray the roentgenologist as well as the clinician. Poor plates, lacking definition, not large enough to include the whole chest, not made in the briefest possible time, are worse than useless. From them will be drawn false conclusions.

The writer has in mind a case of suspected partial pneumothorax that was radiographed at his request, and a negative report returned. Examination of the plate showed that it was not large enough to include the very area under suspicion. Another plate of the suspected area clearly revealed the partial pneumothorax.

Again, in a case of encapsulated empyema, where the diagnosis was confirmed by the x-ray, and the pus evacuated, the patient's septic type of temperature continued. A repeated x-ray examination was interpreted by the radiographer not to disclose any other pocket. Yet pus was surely indicated by the febrile movement. Physical examination suggested the only possible location of fluid as coinciding with the normal splenic dullness at the left base in the axillary line. Pus was found at this point.

This illustrates the great need for the physician to be able to interpret his own plates. It teaches him not to follow blindly his colleagues' opinion nor to ignore utterly important clinical evidence.

The writer does not wish to be understood to say that the physician should rely solely on his own judgment or set up his interpretation of a plate above that of his colleague, the radiographer. There are two extremes of opinion. On the one hand, is the clinician who refuses point blank to give the x-ray man any clinical data whatsoever. "Forsooth," says he, "if I tell him the history, he will make the diagnosis from it and not from the plate." His position is as unsound as that of the clinician who is blind to the secrets of the radiograph and accepts as gospel the roentgenologist's opinion. Between those two extremes lies a middle ground upon which the physician and x-ray man should get together. There is unquestionably a group of cases in which the wise radiologist should —and does—speak thus conservatively, "Here is pathology, what is the clinical history?" Similarly the laboratory man is compelled to report on a Wasserman test, "Here is such and such percentage hemolysis, and what is the clinical history?"

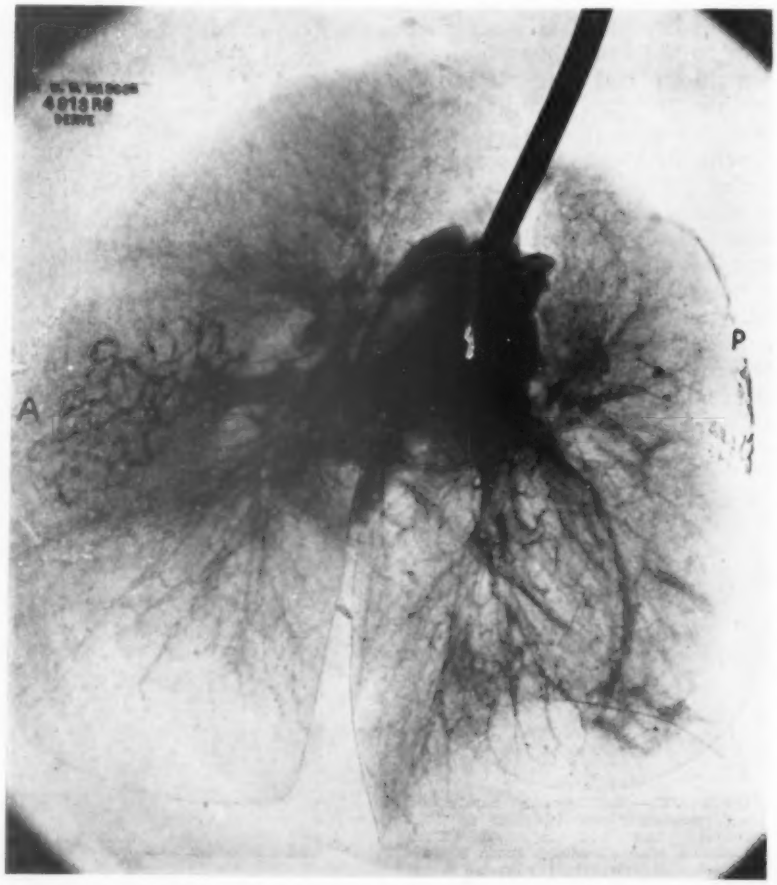


Figure VI.—Compare this lung field with its small ramification of bronchi and parenchyma structure with similar areas in Figure IV.

A good plate is never in error. Its radiological secrets are there if they can be divined. They may be read by one man and not by another, nor yet by either. The clinician, the roentgenologist and the chest radiograph—the former's interpretation, the latter's interpretation, and finally, the facts—do they coincide?

The situation is comparable to a guide and a tender-foot in the mountains. The guide, with eyes and brain trained from long experience to the recognition of shadows and colors, distinguishes a deer from the environment when a tender-foot can not see it.

Admitted that close co-operation between the clinician and the x-ray man is most desirable in the expert study of diseases of the chest, in what particular type of case is such co-operation most profitable? What is the percentage value of the x-ray in the general diagnosis of pulmonary diseases when compared with the clinical history, the physical examination and the laboratory findings? It is evident that such relative evaluation is well nigh impossible in general. A sputum positive for tubercle bacilli is at once, as a laboratory finding, worth one hundred per cent.

On the other hand, there is a group with negative sputum findings where the x-ray is vitally important, perhaps determines the diagnosis. In all cases, the x-ray is important if one includes in the word "diagnosis" a comprehensive report indicating the location of the tuberculous process, the location of areas of consolidation, the presence or absence of enlarged glands, the condition of the bronchi, presence or absence, location and size of cavities, the presence of effusion, pneumothorax, et cetera.

In conclusion, from the clinical standpoint, from long close and careful co-operation with the most skilled radiographers, the writer has found the x-ray most helpful in the following groups of cases:

1—In the diagnosis of frank pulmonary disease to assist in the determination of its tuberculous or non tuberculous nature.
2—In the diagnosis of suspended pulmonary disease.
3—In the presence of manifest tuberculous disease to determine its location and distribution, and to assist in arriving at a prognosis, and as a general guide to handling of the case.
4—In the diagnosis of certain pulmonary complications, for example, pneumothorax, effusion, etc.
5—As a routine preliminary to artificial pneumo-thorax, and in the subsequent care of these cases.

Homogeneous Radiation of the Chest

ARTHUR W. ERSKINE, M. D.

Cedar Rapids, Iowa

EVERY ONE who seriously treats cancer of the breast sees cases of recurrent or metastatic carcinoma in which, under x-ray treatment, apparently complete retrogression of the growths takes place and the patient greatly improves in health and strength, but finally dies from a recurrence or an extension of the disease into the mediastinum or the lung.

We know that in these particular patients, at least, a sufficient amount of x-ray causes the disappearance of the superficial growths or at least holds them in check. It is probably also proper to assume that if the mediastinal glands and all parts of the lung were to receive approximately the same dose as the growths immediately underneath the skin, the effect on them would be the same and the progress of the disease as completely stayed in the deep structures as at the surface.

Admitting the correctness of this assumption, and bearing in mind the complexity of the lymphatic drainage of the breast, and the danger of neglecting one chain of glands while concentrating on another, it is evident that uniform radiation of the whole chest is desirable and even essential to the best results. Our problem is, then, to determine what combination of anode-skin distance, size of fields, number of fields, voltage, and filters will produce the most nearly homogeneous radiation, or, more simply expressed, what set of factors will give the least surface depth dose ratio.

To obtain the average surface-depth distance and the skin area of the chest, about one hundred women were measured by bending a lead wire over the shoulder and around the thorax below the

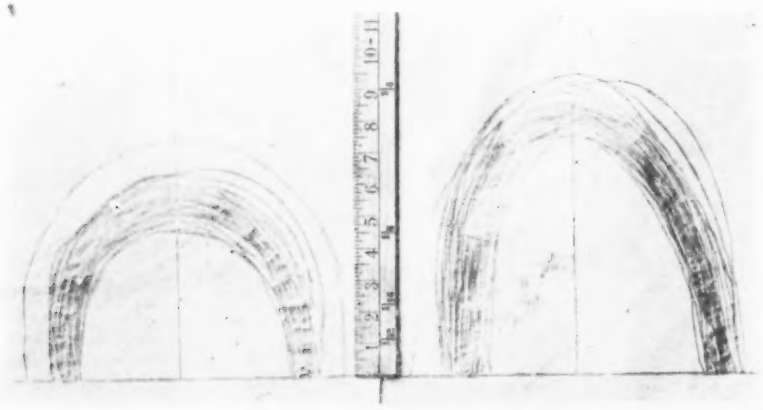


Figure I.—Photograph of composite transverse and vertical sections of one hundred chests.

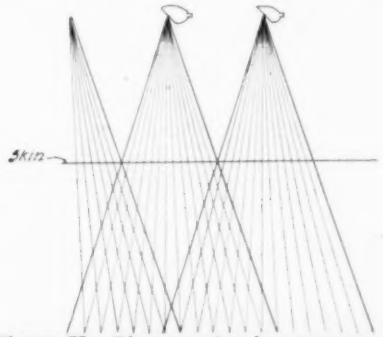


Figure II.—Diagram showing over-exposed erect pyramids of tissue alternating with under-exposed inverted pyramids of tissue when small fields and a short anode-skin distance are used.

nipple line. Composite vertical and transverse sections were constructed from these measurements. (Fig. 1). The average surface depth distance was found to be four centimeters. A paraffin phantom was then constructed, which, when tested by photographic and ionometric measurements, was shown to have approximately the same absorption value as the living chest.

The size of the fields and the anode-skin distance must be considered together. There is no doubt that by radiating the chest through many small fields it is possible to administer a full depth dose. In practice, however, the use of many fields has the following disadvantages:

1—The center of each field is the base of a pyramid of tissue which receives a progressively smaller percentage of the skin dose as depth increases. (Fig. 2).

2—The corner of a field, where it joins the three adjacent fields, is the apex of a pyramid which a short distance under the skin receives almost four times the skin dose. (Fig. 2).

3—There is danger of overlapping areas and of leaving untreated strips of surface between areas.

	Size of Area	Seconds to Discharge to units at Surface	Seconds to Discharge to units at Depth	Quotient
Paraffin-Phantom	2 C.M. Square	17.5	70	4
	15 C.M. Square	12.5	36	2.9
6 C.M. Water	2 C.M. Square	17.5	70	4
	15 C.M. Square	12.5	38	3

Figure III.—Chart showing surface-depth ratios with small and large areas over the paraffin phantom and over 6 c.m. of water.
100 K. V. Filter of 0.5 m.m. copper and 1.0 m.m. aluminum. Current 2 M.A. Anode-surface distance—40 c.m. Anode-depth distance—50 c.m.

If, for example, instead of treating four areas each four centimeters square, ten minutes apiece at an anode skin distance of eight centimeters, the tube be removed to a distance of sixteen centimeters and the four areas treated for forty minutes, it is evident that the skin dose will be the same. The total amount of radiation received by the body will also be the same. It will, however, be more evenly distributed, and there will be a substantial drop in the surface depth ratio, due to the lessened divergence of the rays at the greater distance. The data of Friedrich and Kroenig, as published by Schmitz, shows that there is a further increase in the depth dose when large fields are used, probably because of increased secondary radiation. My own observations corroborate their findings, as shown in Fig. 3.

Position of Ionization Chamber	Seconds to Discharge 30 Units				
Center of Field	68	68	68	7	7
Left Edge	7	7	74	7	7
Right Edge	7	7	72	7	7
Edge of Anode Side	78	78	74	76	74
Edge on Cathode Side	72	68	74	72	7

Figure IV.—Chart showing nearly equal intensity of all parts of the field.
75 K.V., no filter, 12 inch distance.

Measurements with the ionization chamber in different parts of the entire field, when the ordinary type of tube stand is used, show the intensity to be practically the same throughout (Fig. 4).

We may conclude, then, that the anode-skin distance should be just great enough to permit the entire surface to be treated at one time. Trial shows this distance to be sixteen centimeteres, which will evenly radiate a circle ten centimeters in diameter.

The shape of the half chest, roughly, a quarter of a sphere, lends itself admirably to attack in four directions, antero-posteriorly, postero-anteriorly, laterally, and vertically. To radiate the whole chest it is only necessary to expose two additional areas on the opposite side, one vertically, and one laterally.

Granting that exposure of the half chest in four planes from an anode skin distance of sixteen centimeters, utilizing the whole field of effective radiation, tends towards uniformity of distribution of the rays without waste of tissue and energy, it is apparent that our problem has become a much simpler one. We have only to determine, if possible, the combination of voltage and filters that will deliver at least one-fourth of the surface dose to the center of the chest, so that the sum of the four depth doses will equal one skin unit.

In order that relative measurements of intensities might be made rapidly and accurately, we constructed a crude electroscope, equipped with a reading microscope for observing the rate of fall of the gold leaf, and connected to an ionization chamber by an enameled copper wire, which was insulated and supported by paraffin and sulphur, and enclosed in flexible metal tubing. (Fig. 4).

A series of measurements with the ionization chamber at the surface and at a depth of four centimeters in the phantom showed a definite drop in the ratio of the intensities at these two points whenever the voltage was raised. (Fig. 6). At the limit of the apparatus, one hundred kilovolts measured with a sphere gap, the ratio was about eight to one. Abandoning the lower voltages as being less efficient, we made a second series of measurements at one hundred kilovolts, using gradually increasing thicknesses of aluminum as filters. The addition of each layer of aluminum was followed by a further drop in the surface-depth ratio, until, with a filter of ten millimeters of aluminum, the

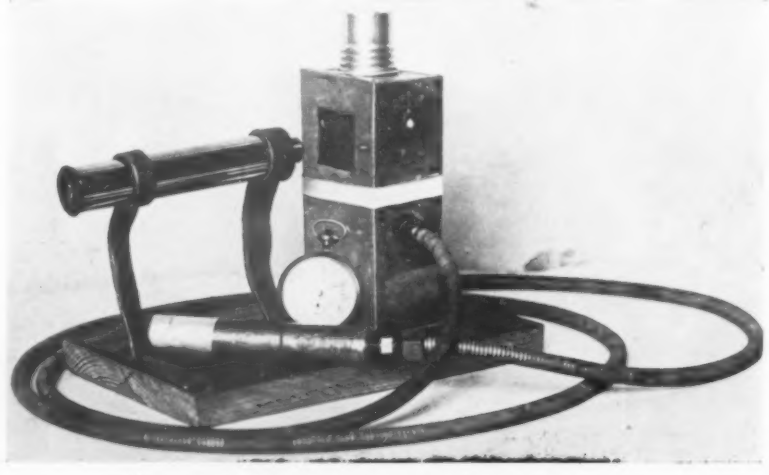


Figure V.—Photograph of measuring apparatus.

necessary ratio of four to one was obtained, (Fig. 7).

The foregoing measurements were all made through a diaphragm two centimeters square in order to eliminate secondary radiation. When the exposures were made over an area six centimeters square, the ratio was reduced to three to one, (Fig. 3).

When one-half millimeter of copper backed with a millimeter of aluminum was used in place of the filter of ten millimeters of aluminum, there was no material difference in the readings, (Fig. 3).

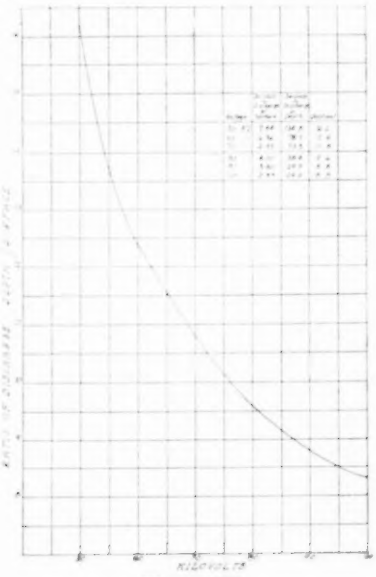


Figure VI.

The rate of discharge of the electroscope with the ionization chamber at a depth of four centimeters in the paraffin phantom, was the same as when it was placed under two and one-half centimeters of water, (Fig. 3). This corresponds closely enough to the thickness of the chest walls of the average sized woman of cancer age.

The conclusions to be drawn from this series of observations are:

1—The half chest should be treated from four directions, using the whole field of effective radiation.

2—The anode-skin distance should be sixteen centimeters.

3—At least one hundred kilovolts should be used.

4—The rays should be filtered through ten millimeters of aluminum or one-half millimeter of copper.

5—The use of these factors will permit nearly homogeneous radiation of the chest.

My thanks are due to Prof. L. B. Loeb of Chicago University, and Prof. L. D. Weld of Coe College, who offered many helpful suggestions as to the construction of the measuring apparatus.

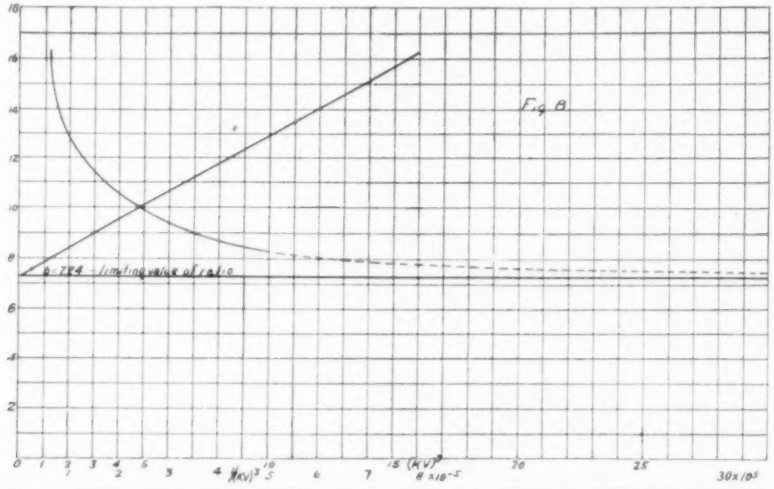


Figure VIII.—The solid portion of the curves in Figures VIII and IX was plotted from the data, the dotted portion was computed. In the case of varying voltage with no filter, the curved line was obtained by plotting the ratio against the cube of the voltage, and the straight line by plotting it against the reciprocal of the cube of the voltage. In Figure IX the curved line was obtained by plotting the ratio against the thickness of the filter and the straight line by plotting it against the reciprocal of the thickness, minus a constant, which was computed from the equation.

DATA FOR CURVES IN FIG. 8

Seconds to Discharge at Surface	Seconds to Discharge at Depth	Ratio	kv (kv)^3 $\times 10^3$	1/(kv)^3 $\times 10^{-6}$
9.44	134.8	16.2	50	125	80
6.36	78.5	12.4	60	216	46
4.95	52.3	10.8	70	343	28
4.00	38.4	9.6	80	512	19
3.40	29.9	8.8	90	729	13
2.93	24.4	8.3	100	1000	10
Computed		7.8	120	1728	
		7.6	140	2744	
		7.25	200	8000	

Distance to Depth—50 cm.
Distance Surface—40 cm.
No filter.
Y=Ratio.
X=KV
(y-b) x^3 = K —Equation of Curve

K=1,127,000
b=7.24 —Minimum Value of Ratio.

Figure VII.

and to Mr. Edward M. Smith, whose assistance in taking the readings and arranging the data was invaluable. The curves and data for Fig. 8 and Fig. 9 were furnished by Mr. Ernest E. Smith.

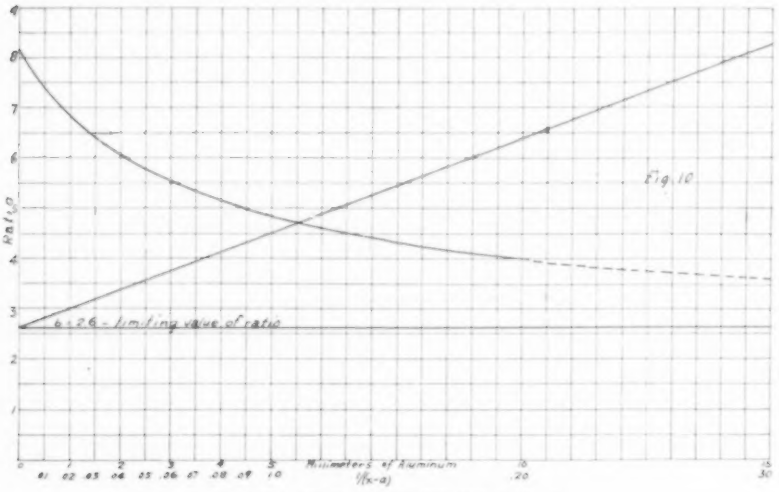
Discussion

DR. W. D. COOLIDGE, Schenectady, N. Y.: Dr. Erskine has referred to the spark-gap tables given in the Standardization Rules of the American Institute of Electrical Engineers, and, in accordance with these tables, has expressed his results in **effective** volts.

As the major part of the x-ray output of a tube takes place when the voltage is near the maximum, it seems better to give x-ray data in terms of **maximum** voltage. The transposition is effected by multiplying the effective volts by 1.41.

DR. HENRY SCHMITZ, Chicago: The paper of Dr Erskine shows ex-

actly what can be done with the application of physical measurement in x-ray therapy, by making such an instrument, which any one can do who knows about the relative intensity of radiation. That is exactly what we want and that is what is claimed by Froelich for his instrument. It also shows us what amount of voltage we have to use and what amount of filter and distance in order to have as favorable a proportion between the surface and the depth dose as we can possibly obtain.



DATA FOR CURVES IN FIG. 9

Seconds to Discharge at Surface	Seconds to Discharge at Depth	Ratio	Millimeters of Aluminum	(x-a)	1/(x-a)
2.7	21.8	8.1	0	3.45	.29
3.7	25.7	6.8	1	4.45	.225
4.9	30.1	6.1	2	5.45	.184
6.3	35.3	5.6	3	6.45	.155
7.4	38.7	5.2	4	7.45	.135
9.4	46.2	4.9	5	8.45	.118
11.4	53.0	4.6	6	9.45	.106
			7		
14.2	60.0	4.2	8	11.45	.087
			9		
18.7	75.0	4.0	10	13.45	.074

Distance to Depth —50cm.
Distance to Surface —40cm.
KV=100
Y=Ratio
X=Mm of Al

Constant		
	A=	—3.45
	B=	2.6
	C=	18.8
	K=	27.7

(x-a) (y-b)=C=Eq. of Curve.

The question of treating cancer of the breast is much easier than the treating of cancer in the body. I feel with our present equipment we will obtain quite favorable results with cancer superficially located. Probably we can treat deeper cancers if we increase the focal distance from sixteen to twenty-four inches, or even to thirty-two inches. If you do, you need only one field. In treating supra-clavicular lymph nodes you must have even more homogeneous radiation than Dr. Erskine did. Not only that, but the difference between the surface and depth dose will be so small that the depth dose will be almost as intense as the surface dose.

Regarding the question of voltage, we all seem to be at sea. We do not know whether we should use our present machines or not. Last year when I returned from abroad a great many members of the American Radiological Society visited me and asked me if it was necessary to use the high voltage machine. I said, "No." I wish to repeat the answer I received from Professor Froelich when I asked him whether to do this work it would be necessary to get one of his machines. He laughed and said, "You can use any machine." I can see only one benefit from the high voltage, that is that you can use a higher filtration and save time and obtain a better ratio between surface and depth dose, especially in internal carcinoma. Consequently, the question arises in my mind whether it would not be better to treat a patient with a deep seated carcinoma with a low voltage in one sitting of say six hours instead of a high voltage for one-half hour.

Dermoid Cysts in the Thorax -- With a Review of the Literature

JOHN T. MURPHY, M. D., F. A. C. P.

Toledo, Ohio

I WOULD like to report the following case, not as a dermoid, but as a tumor mass in the upper chest evidently connected with the mediastinum.

The patient, a girl, age thirteen, presented herself for x-ray examination on October 28, 1920, with a request from the attending physician for examination of the cervical spine. Examination including cervical and dorsal spine and entire thorax was made with the following result:

There is seen a sharply defined mass occupying the left upper quadrant of the thorax extending from the mediastinum to the latter wall. The surrounding lung was normal in appearance. Heart shadow normal in shape, size and position. Left diaphragm shadow higher than normal. There is a definite upper dorsal curve of the spine to the right with a compensating curve in the cervical region. No evidence of bone destruction in the spine. With this report in hand a complete examination of the patient was made November 22, 1920.

Family History: Father and mother living and well. One sister nine years living and well. None dead. No family disease.

Past History: Forceps delivery, but healthy as a baby. Measles and whooping cough at about five years. Mumps at seven. Always strong and robust until December, 1918, except for occasional cold in head. Development and nutrition seem to have been normal.

Present Illness: The mother insists that since two years of age, she has noticed the child's right shoulder higher than the left. There was no complaint of pain or anything else, however, until December, 1919, when she complained of pain in the left shoulder blade when she moved her arm, coughed or sneezed. Then the pain disappeared until March, 1920. At that time she had an injection of diphtheria antitoxin (prophylactic) followed in two days by return of pain in left shoulder. The pain disappeared again, returning in August, 1920, since when it has persisted, spreading to the right shoulder, down to the elbow, and to the left hand, involving the little finger and the next finger. The pain comes and goes, awak-

ens her usually at two a. m., lasts a few hours and then disappears. Five days ago she stumbled on a rug and later in the day she stumbled again and fell. No disturbance of gait had been noticed before this except that she wore out her left shoe faster than her right. In the past five days she has walked stiffly and has stumbled almost every day. No cough or disturbance of respiration. Vision seems good. Has not menstruated. Slight loss of weight.

Examination: She is a small girl, somewhat under-developed and under-nourished for her size. Weight seventy pounds (normal weight ninety-one). Color is good. Gait, spactic ataxia. At rest there is some choreoform jerking of the arms.

Head: Left pupil about half the size of right, but both react to light and accommodation. Slight ptosis of left lid. Ears negative.

Nose—Left nares smaller than right (old fracture?) Sinus infection left. Deviated septum with left obstruction.

Mouth—Both tonsils large and crypts infected. Palate and uvula move symmetrically. Tongue in mid line.

Chest: Spine—Rigidity of neck so that she can't put chin down on chest. Marked cervical curvature to left, apparently compensated by lower dorsal to right and lumbar to left. Brawny swelling above left clavicle up about two cm. Costal margins move freely and symmetrically. Upper three ribs on left do not move. The superficial veins on left from third space to shoulder are dilated. Right scapula is winged, but there is good control of all the shoulder muscles. On percussion flat on left above and below clavicle and down to spine of scapula and to second rib in front. Normal resonance below clavicle, hyperresonance on right. Absent breath sounds over flat area, clavicle tubular breathing at borders and increase in voice sounds; relatively normal below when a few indeterminate rales are heard. Increase in normal sounds in right. Cardiac dullness not increased or misplaced. Tones clear. Rate rapid—over 200. Abdomen negative.

Reflexes: Eyes normal except size of pupils. Abdominals absent. Knee jerks and ankle jerks inward. Ankle, clonus both sides, left greater than right. Babinski plus both sides. External maleolar sign gives fanning both sides.

Sensation: Sharp and dull show some impairment left seventh space down, right third space down to feet. Touch remains, but is poorly localized in feet.

Musculature: No paralysis but spactic ataxia of arms and legs, beginning bilateral foot drop. No atrophy, etc. Right scapula wings as though the Romboid is paretic. Grip left hand less than right.

Urine: Acid, 1018. Albumin negative. Sugar negative. Misroscopic negative.

Blood: Hb. 85 (Dare) W. B. C. 9800.

P. M. N.	60
P. M. E.	1
P. M. B.	1
L. Lympho.	21
S. Lympho.	13
Trans.	4

Diagnosis: Tumor of the lung probably a dermoid (possibly an echinococcus cyst) with involvement of the cervical cord caused either by direct pressure or metastasis.

On November 24th a subsequent x-ray examination was made in which the fluoroscope was used and additional plates made. The tumor is as well defined as in the previous examination. There is some evidence of an increase in size. The density of the tumor is equal throughout. There is no pressure on the eosaphagus. The tumor is not expansible, but moves with pulsation of the heart. The heart is pushed to the right. There is complete eventration of the left diaphragm which does not move on respiration.

On November 29th a physical examination was again made with the following result: the tumor has increased in size, as shown by increase in bulge above and below left clavicle and extension of area of flatness. The heart is now placed to the right about four cm. beyond sternum and the apex has come in to correspond. The spasticity of legs and foot drop are more evident.

Subsequent history: The spastic condition of the patient increased so that within a few days after the last examination she was confined to bed. No great amount of cough or dyspnea was developed at any time during the subsequent course.

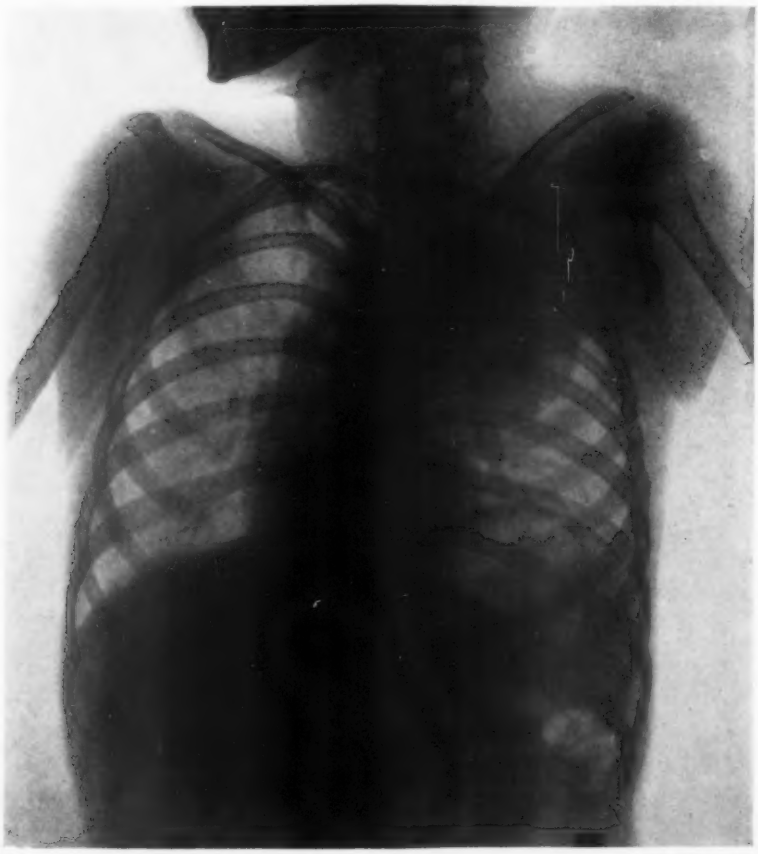


Figure I.—Posterior anterior view showing mass in left upper chest.

The patient suffered but little pain and was apparently in about the same general condition for six weeks, when respiration began to be slower and shallower, and she died in this condition. No evidence of rupture of the tumor was seen at any time. Postmortem was refused and a confirmation of the diagnosis was impossible. I want to thank Drs. Doherty and Grosh for the physical examination of this patient.

As to frequency of dermoid cyst in the thorax, several reviews of the literature have been made. Dangschat in 1902 collected forty-four cases. Morris in 1905 was able to find fifty-two cases. In 1916 Hertzler made a very exhaustive review of the literature and found seventy-two cases, to which he added one of his own. Harris in 1919 reviewed the subject thoroughly, added a case of his own and found nineteen additional ones in the literature, making a total of ninety-three. To these collected reports I have been able to add nineteen well authenticated cases, making a total of 112. Hertzler in his review, taking the cases reported previously for age, found that the majority of cases were between twenty and thirty, but that cases have been reported from infancy to past fifty years. In eleven of the nineteen additional cases the ages were not given. One case was under ten years of age, four under twenty, three under thirty, four under forty, and one between forty and fifty. None of these cases exceeded fifty years of age. The sex of the patients was about evenly divided between male and female. In ten cases it was not noted. Of the remaining nine cases, five were males and four females.

Dermoid cysts have been found occupying all portions of the thoracic cavity. The most common portion, in previously reported cases, has been the upper mediastinum between the sternum and the great vessels. Some cysts extend from the sternum to the diaphragm, displacing the lung. A case of dermoid has been reported anterior to the heart, displacing this organ and the pericardium backwards. The locations of the growths in the additional cases reported show ten to be in the anterior mediastinum, three on the right side, and in six the part of thorax was not stated. The origin of dermoid cyst in the mediastinum is closely associated with the thymus gland. Its close relationship between the ectodermal and the entodermal elements of the neck has been frequently pointed out. That the tumors have their origin near the upper portion of the sternum is evident, as even the tumors which exhibit their bulk in the lower thorax retain their attachment higher up. It is admitted by all investigators that apparent tumors of the lung itself have their origin in the mediastinum. At first glance it would seem difficult to account for the presence of a large dermoid in the thorax, but a review of the development of the sternum throws much light on the subject. The two halves of the sternum in the embryo are widely separated from each other and coalesce in the median line. This coalescence is liable to be faulty and a condition analogous to spina bifida is produced. In this line of coalescence we have skin line recesses. Should a piece of skin become sequestrated during the development of the sternum it may become dislocated forward to the outer surface or backward to the mediastinum, a condition in every way parallel to the variations in the position of cranial dermoids. The microscopic appearance of these tumors is usually a smooth, rounded mass, sharply outlined against the normal structure of the lung. This description, however, only fits the classical case, one that has presented only slight symptoms. These tumors seem to have the faculty of causing an irritation of the surrounding lung tissue, due to some changes of the contents, which inflame the sac and irritate its environment, causing a pleurisy and an exudation that may greatly resemble a pneumonia. In the tumors of longer standing the picture may be different. Multiple cysts may form, the surrounding inflammation and pressure may cause consolidation and erosion of the lung, rupture into a bronchus, erosion of blood vessels with sometimes very large hemorrhages and all the conditions that go with a rapidly growing

Figure II.—Anterior posterier view showing mass in left upper chest. Dermoid Cysts in the Thoracic Cavity.

mass inside of a closed cavity may occur.

Dermoids in the thorax present two different types, one the simple dermoid, in which are found only tissues of epidermal origin, the other the teratoma, in which tissues of all three layers are combined. The simple dermoids are single or multilocular cysts with smooth epidermal lining, this lining at times contains dermal glands and incloses hair and sebaceous material. The teratoma are complex tumors which may contain beside epidermis, bone, cartilage, tissue from the nervous system, the thyroid, the intestinal tract and respiratory ciliated epithelium. Authoritative statements from the literature point to the fact that most dermoids are of the tridermal type, and it is probably always tumors of this type that undergo malignant degeneration. At least one solid dermoid tumor of the mediastinum has been reported, an important point to be noted later under diagnosis.

The symptomatology of dermoids consists of two distinct types—the simple dermoid causing its symptoms mainly by its presence, and the cyst that, for some reason, has become an active irritant to the part in which it lies. The symptoms of a simple dermoid are usually of the pressure type, reflex cough due to pressure on nerves, dyspnea and pain. Pain in the chest is often one of the earliest signs that can be elicited in the history of the case. The secondary symptoms are those due to the involvement of the surrounding organs, pleurisy, irritation of the bronchi with the expectoration of bronchial mucus, rupture of the cyst into a bronchus with the expectoration of contents of the cyst such as hair, sebaceous material and a honey like fluid due to a mixture of the contents with the bronchial mucus.

Differential Diagnosis: Usually these tumors are of a size great enough to give a definite dullness over their location. The majority of tumors being in the upper portion of the chest, dullness extending upward toward and into the supraclavicular spaces is suggestive. In the larger tumors the dullness often occupies a great portion of one side of the chest. In some cases a definite bulging of the supraclavicular space, due to a tumor mass projecting upward from below with a boggy feel, adds another point to the picture. Fixation of the ribs during respiration with absence of breath sounds and rales and increase in voice sounds are found over the flat area. Examination of the sputum with a discovery of hair and sebaceous material is diagnostic. The sputum has often a glycerine-like appearance. The absence of pus cells may differentiate from an abscess of the lung or an empyema. Tubercular bacilli may be found and help differentiate a tuberculosis, but Harris calls attention to the fact that in a number of cases both conditions have been present at the same time. The use of exploratory puncture is pathognomic if cyst contents are obtained. It is also pathognomonic in echinococcus cysts, if the hooklets are obtained. Puncture of these latter cysts may be dangerous, as a grave toxemia may follow from absorption of the fluid. Maydl reported eleven fatal cases following thoracentesis. Eosinophilia and the Bondet-Gengu reaction are positive when present, but not very reliable. The history of a patient coming from a region where echinococcus disease is prevalent is suggestive. The surrounding reactive inflammation may cause a greatly thickened wall excluding the needle from the cyst itself, or, as in the case reported by Christian in the Journal of Medical Research, the tumor was a solid teratoma, operatively removed with good recovery. The differentiation between aneurysm would depend upon the eliciting of the classical signs of this condition, the age of the patient, the presence or absence of a positive Wasserman, the presence of pulsation in the tumor mass, expansion under fluoroscope, etc. Differentiation from empyema will depend upon the exploratory needle. Puncture of the cavity with the extraction of pus accompanied or followed by an acute condition of fever and chills establishes this condition.

In malignant tumors the usual rapid course of this condition, with cachexia and loss of weight in counter distinction to the long history of dermoids, is an important point, however, when a dermoid becomes infected its increasing growth may be as rapid as that of a malignancy and the early symptoms may not have been noted. Benign tumors of the thymus and lipoma have presented pictures that closely simulate dermoids and the diagnosis here would depend upon findings of the symptoms already mentioned in this condition. A differential diagnosis, however, is very difficult. Intrathoracic goiter may present a picture adding new difficulties to the diagnosis. The tumor mass in the latter condition is usually bilateral, roughly wedged shaped in appearance with the apex of the wedge downward, blending into the great vessels below. In Hodgkins disease the tumor masses are usually multiple, may or may not be bilateral, and the presence of enlarged glands in other portions of the body is a great aid in the diagnosis.

Prognosis and Treatment: Many of these cases present histories running over long periods of time. The common cause of death has been hemorrhage and dyspnea. The size and situation, together with the reactive changes which take place in and about the tumor are the determining factors. Except in very small tumors and favorable situations, it is safe to say that the patient's life will be in danger eventually unless the tumor is removed. Malignant degeneration occurs in a small percentage of the cases. The majority of the patients have presented symptoms over periods varying from one to five or six years. It is evident that the only treatment that can be of any avail is surgical. Of the cases found by Hertzler, twenty-seven were operated upon with a recovery in five cases, improvement in thirteen, in four the result was not stated, and five died as a direct result of the operation. In the nineteen cases reported by Harris, seven were treated by incision and drainage of the cyst cavity, of these three died, one made a complete recovery, two an incomplete recovery, and in one the result is not recorded. In five cases the cyst was completely extirpated, of these four recovered and one died. Seven cases were not treated, and in five the results were not recorded. In the nineteen additional cases which we have been

able to find, four were not operated upon, diagnosis being confirmed by autopsy, in four cases the original reports are not available, seven cases were operated with complete recovery, two were operated upon with a partial recovery, one requiring a secondary operation and one having a fistula remaining, and two died at operation. Harris, Bastiandi and Von Isenberg recommend total extirpation as the ideal treatment, but in many cases, as in one recorded by Pervis and Oudard, in which the mass consisted of five tumors, radical removal was found impossible and the patient died, autopsy showing a vast tumor in the right half of the thoracic cavity weighing 1.65 kilos. Death in this case followed later due to rupture in the pericardial cavity. From these cases it is seen that the operative removal is not impossible, as, following the operation in the fifty cases in only part of which it was possible to do a complete removal, thirty-nine cases survived and were improved by he operation. It is obvious, therefore, that surgical treatment following an early diagnosis is the method to be employed in the treatment of these cases.

In addition to the cases reported by Hertzler and Harris, the following have been found in literature:

1. Stilling: Eine Flimmercyste des Mediastinum anticum. Arch. f. path. Anat., 1888, cxiv, 557. Patient a man forty-five years old. Tumor found on autopsy and histologically verified. (Teratoma).

2. Hermann: Ueber eine Flimmercyste d. mediastinum. Prag. med. Wchnschr., 1890 xv. 146. The original report is not available.

3. Atlas, A.: Teratoma cysticum mediastinum, anterioris. "Yuzhno russk. med. gaz.," Odessa, 1894, iii, 633, "Allg. Weiner med. Ztg," 1894, xxix, 502. Age of patient, twenty-four years. Died in hospital from dyspnea and cyanosis. Autopsy showed large cystic teratoma (dermoid) in left upper side of anterior mediastinum compressing aorta, etc., and ruptured into bronchi, etc. No histological examination mentioned.

4. Fletcher: A Congenital Cyst of the Mediastinum. Trans. Path. Soc. of London, 1896-7, xlviii, 249. Girl of six years. Died in hospital of dyspnea, cyanosis, etc. Autopsy showed cyst lying posteriorly to right bronchus, cyst lined with ciliated epithelium. Author thinks cyst has arisen in connection with fetal esophagus.

5. Medvel: (Dermoid cyst coughed up in pieces by nursling). Orvosi hetil. Budapest, 1901, xlv, 735. The original report is not available.

6. Christian: Solid teratoma of the mediastnium. Jour. Med. Research, 1917, xvi, 275. Operatively removed with good recovery.

7. Opokin: Dermoid cyste der Lunge. Russ. Archiv. f. Chir. Abstract in Zentralbl. f. Chir., 1908, xxv, 144. Patient aged twenty-three years. Operated for supposed lung abscess; found dermoid cyst ruptured into bronchus and lung. Recovery complicated by fistulae, etc.

8. Morestin: Kyste dermoide du creux sus-sternal. "Bull. Soc. Anat. de Par.," 1912, lxxxvii, 395. Patient a woman of thirty years. Tumor exactly median. Successfully removed by operation; verified hystologically.

9. Katase: Ein seltener Fall von Lungenteratom. "Centralbl. f. allg. Path. u. path. Anat.," 1912, xxiii, 146. Man of forty-four. Dermoid cyst of the right lung diagnosed intra-vitam; not operated; diagnosis verified with histological examination at autopsy.

10. Sebusterowna: Cancer of the wall of a Cermoid Cyst of the Anterior Mediastinum. "Gaz. ek, Warszawa," 1913, 25, xxxiii, 355. Original report is not available.

11. Pohl: Ueber Mediastinal Dermoide. "Deutsche Ztschr. f. Chir.," 1914, cxxx, 481. Infant, operated in hospital. Died during operation. Autopsy, histology, teratoma (dermoid) of the anterior mediastinum.

12. Perves and Oudard: Kyste dermoide intra-thoracique. "Arch. de med. et phar. nav. Paris," 1914, ci. 120. Man, twenty-seven years. Five tumors. Radical removal found impossible after resection of fourth and fifth ribs. Patient died. Vast tumor in right half of thoracic cavity. Histologically a dermoid cyst. Weighed 1.65 kilos. Death due to rupture of cyst into pericardial cavity.

13. Bendz: Case of Teratoma of the Upper Thorax. "Hygiea," Stockholm, 1915, lxxvii, 1336. Original report not available.

14. Naegeli: Extirpation einer Dermod cyste des vordern Mediastinums. "Beitr. zur. klin. Chir.," 1918, cx, 672. Dermoid cyst of the anterior mediastinum successfuly extirpated. Verified histologically.

15. Payr: Fall von radikal operierten Mediastinal Dermoid. "Muenchen. med. Wchnschr.," 1918, lxv. Case similar to foregoing.

16. Sonnenschein: Dermoids of the Anterior Mediastinum. "Ann. of Otol. Rhinol. and Larygol.," 1920, xxix, 427. Woman of thirty years. Mass believed to be thymus operated. Tumor which was histologically a dermoid cyst removed. Good recovery.

17. Kleinschmid: "Muenchen. med. Wchschr.," 1920, lxvii, 862. Reports two cases. In first case pleural cavity was found perforated. Secondary operations necessary on account of fistuae, etc., and to avoid infection. Histologically a dermoid. In second case, the cavity was closed at once and healed primarily. Radical operation with primary suture obtained very rapid recovery. Histologically a dermoid cyst.

18. Hale: Medical Rec. N. Y., 1920, xcviii, 1019. Fluctuant tumor. Chest opened; owing to adhesions tumor could not be enucleated, but was evacuated. Recovery.

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4—Hertzer: Dermoids of the mediastinum. Amer. J. Med. Sc., Philadelphia, 1916, ciii, 165.

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12—Cloetta: Quoted by Katase.

13—Jores: Quoted by Katase.

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*—Read at mid-year meeting, Madiological Society of North America, Boston, June 4, 1921.

The Pulpless Tooth and Root Canal Treatment of the Periapical Abscesses. Their Influence on Extraction as Indicated by the X-Ray Examination.

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New York City

I AM approaching this subject from the point of view of a physician and roentgenologist, an interpreter of the x-ray film in terms of pathology. My interest has fostered a close study of the whole situation, including the opinions and writings of the dentists of the present time, so that I have not only my own observations as a medical man and roentgenologist to draw upon, but also the attitude of the dental profession as a whole. Your time and attention will be conserved if I select for you from dental literature what is basic. I am following and agree with a few dentists whose names you should remember and whose work you should follow closely—such men as Grieves, Black, Talbot, Thoma, Logan, Hartzell, Dewey, Noyes, Box, also physicians such as Billings, Haskins, Rosenau, Barker, etc.

Dr. Clarence J. Grieves, Oral Surgeon for Johns Hopkins Hospital, where, among others, he works in close relationship with Dr. L. F. Barker, has covered this subject in a very comprehensive way in his article which appeared in the April, 1921, issue of the Journal of the National Dental Association. His classification of the teeth based on the extent of their disease I shall summarize, along with his conclusions which he recommends as good practice in treating the different classes. In introduction he says: "It is next to impossible for dentists to consult intelligently among themselves upon this subject. How, then, can they expect their medical confreres to comprehend in oral pathology what, to their own minds, is not clear"? [1] He then offers this classification as a clinical discussion with a double object in view; first, to clarify the subject in the minds of the dentists themselves and save countless, otherwise functional, teeth; second, to promote a better understanding, and closer co-operation between both dental and medical professions.

In order to get the anatomy and histology of the tooth and the alveolar process clearly in mind, and the relations of the **lamina dura** study carefully Fig. I.

Class I.—Average Teeth; Pulps Vital

"Conclusion 1. Dental caries is dual in character, being a chronic tooth-wasting disease, with tissue necrosis or liquefaction superficially, and pathogenic forms irregularly invading the hard underlying dentinal matrix. This sepsis begins in the granular layer of Tomes, and is the primary infective focal portal. Therefore, because dentin is hard, or free from soft caries, it is not necessarily free from bacteria; and some effort must be made to sterilize every cavity-preperation in vital teeth.

"Conclusion 2. The normal pulps of vital teeth should be devitalized rarely.

Class II.—Sound Teeth; Pulps Diseased by Pyorrhea.

"It is not proposed, in discussing Class II. to dwell upon gingival diseases, except as they tend to produce pulpal or periapical disease."

"Dewey and Noyes [2] [3] have demonstrated the association of three sets of lymph vessels with the blood supply that completely surrounds every tooth, which is seated, so to speak, in a basket of periodental membrane, dense socket lining (lamina dura), and blood vessels, all of which tissues these lymph vessels penetrate, nourish, and drain. The largest group passes from the gingiva, centrally down through the membrane, paralleling the cementum; it is joined by gingival middle third groups, the first of which carries infection from gingival crests to the nearest lymph nodes. Thus, a superficial gingival infection would be deflected over the interseptal crests; but a periodontal infection would finally reach the subapical tissues, splitting the peridontal membrane on its way, as in a true pyorrhea pocket.

"At this point we would impress you with the results of recent research by Henrici and Hartzell [4] who, in studying one hundred coronally sound, but pyorrheal teeth, found forty-eight per cent of the vital pulps invaded by lympocytic infiltration and the vessel walls much damaged, with coccal forms definitely established in the tissue. These findings should settle the question of hematogenous pulp infection.

"Conclusion 3. Any pulpless tooth, the periodontal membrane of which is gingivally purulent, should be removed, no matter how perfectly filled, or how well repaired subapically, whether periapically diseased or not; for, at any time, it might become diseased by the gingival pathology. If pulp devitalization is absolutely necessary, it should be practiced on only such pyorrheal teeth as are not swaying to the middle third; or those cured (?) by peridontic treatment; and then, on only those in which apical hyperplasia has closed in part the foramina as noted. (Such hyperplasia is usually demonstrable, clinically and by good radiographs.)

Classes III. and IV.—(III.) Abraded or Eroded Teeth Occasional Pulpal Symptoms; (IV.) Average Teeth; Pulps Diseased.

"Conclusion 4. Unless pulp symptoms or exposure arise in eroded, abraded or senile teeth, it is meddlesome practice to risk pulp devitalization and defective canal filling, just because pulps **might** degenerate, the exception to this rule being pyorrheal teeth, which might be infected by the gingival pathway.

"In all stages of degeneration, except the calcific, when the pulp is finally infected by opening the pulp cavity or otherwise, periapical disease is both rapid and virulent. This is to be expected and illustrates a lack of the usual resistance, resident in healthy dentin and pulp; for pulp cells are

*—This paper is an abstract of "A Classification of Teeth, the Diseased Pulps and Apices of which are Related to Infective Focal and Systemic Sequelae," by Clarence J. Grieves, D. D. S., Baltimore, Md., published in the April, 1921, issue of The Journal of National Dental Association. This article, as originally prepared by Dr. Grieves, was first published in the September, 1920, issue of The Journal of Dental Research.

fibrotic, fatty, or gangrenous, as are the fibrillae. The entire tooth is thus a perfect culture tube.

"Conclusion 5. Cases in Class IV. (fresh surgical exposure of symptomless pulps, made through hard dentin, even at the risk of its being infected) are hopeful. Capping should be attempted, with frequent clinical and radiographic survey; but the slightest periodontal symptoms demand immediate pulp removal. This is especially true of young unfinished apices, which should be considered with a full understanding of the results of the recent research on apical cementum by Box [5].

"No pulp exposure with the least symptoms of any disease, except calcific degeneration, should be capped, for periapical infection is inevitable, insidous, and symptomless, hence dangerous.

Class V.—Carious Teeth; Pulps Infected.

"Class V. (carious teeth, infected pulps, but subgingival dentin not completely infected, with the apices free from disease and vital) is most interesting, because it is in this group that the profession, in the past, has done its best work.

"In all data submitted, the radiograph and its interpretation is a determining factor. While open to criticism, which will be discussed later, the radiograph, within clinical limitations, is the means by which the extensive occurrence of such lesions was first definitely discovered, not only about teeth, but in many other organs. It is still accepted as a most valuable diagnostic adjunct by the surgeon, so this is hardly the time for dentists to quibble over it.

"The following deductions are justified, from the standpoint of histopathology, as relating to conditions that guard the apex and prevent or delay its infection.

"(A) In chronic pulpitis, and certain stages of pulp degeneration and gangrene, complete destruction of the subgingival odontoblasts and fibrillae is usually a slow process. Persistence of this layer of cells, vitally attached to pulpal walls, has been noted by many histologists, for all pulp diseases. It guards the apical third of the dentin, possibly transmitting sensation, which often persists, indicating a vital apex. Such would not be the case, if this layer was necrotic or liquefied.

"(B) Pulpal infection is generally localized centrally. Excepting the initial lesion, the carious exposure, it follows the large vessels and perivascular lymphatics centrally through the pulp, leaving tissues adjacent to dentin and cementum intact for some time. Indeed, this pathway is more accessible for the production of periapical disease than of general infection of the apex.

"(C) The presence of nerves, under these pulp conditions, sufficently nourished and functional to record pain, denotes a persistent vascularity. The common resistance to arsenic, cocain, and other medicaments, offered by many stages of chronic ulcerating and granulating pulpitides, is hopeful, and indicates activity of nature's usual granulation methods, protecting the apex and contained vessels against infection.

"(D) The results of recent research, by Box [5] conclusively demonstrate a complete circulation of tissue fluids, through the cemental apex from the periodontium via the lacunae and canaliculi, the granular layer of Tomes and dentinal fibrillae, to the apical third of the dental pulp. This condition emphasizes the source from which the cemental matrix of a vital apex, and possibly apical pulp-shreds and vessels, are nourished; for they are thereby in touch with serologic factors, which not only fight infection, but prevent it. It is a most hopeful feature; but, when once this labyrinth is infected, these lines of communication become pathways by which sepsis passes into the apical periodontium, destroying and detaching it, and creating a thoroughly septic, necrotic, apex and periapical disease.

"(E) There is the further fact that this means of communication

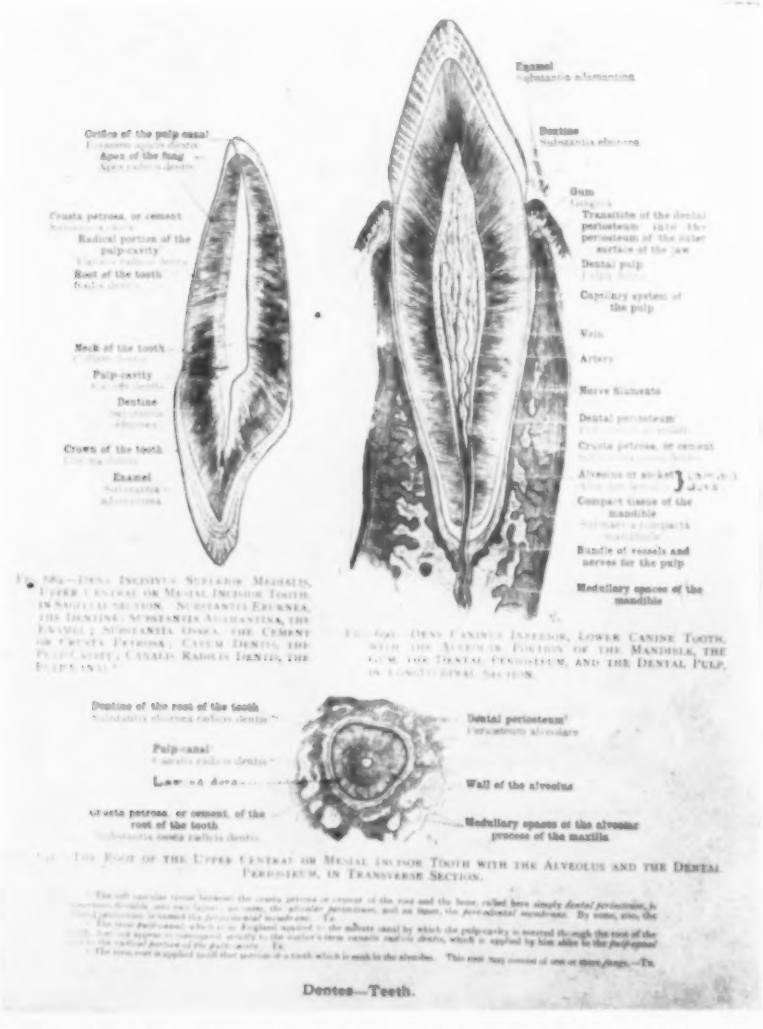

Figure I—Toldt's Anatomy, Part IV, Page 426. In order to get the anatomy and histology of the tooth and the alveolar process clearly in mind, and the relations of the lamina dura study this illustration carefully.

cannot be demonstrated in middle third cementum (5), the first circumferential lamella (lying next to the granular layer of dentin) of which is unorganized, with no connecting canaliculi crossing it from pulp to periodontium. This is, indeed, a protective feature, for, if infection can be prevented from reaching the apical dentocemental communication, a definite barrier exists against it in the middle and gingival thirds. If this were not true, alveolar abscesses would commonly occur beside the root on the middle third, as pararadicular, instead of periapically on the apical third.

"What may we expect of future canal surgery? It has been demonstrated by Brooks and Price [6] that dentin and cementum of experimental 'dead' teeth in the laboratory, once thoroughly saturated with a known and virulent infection, cannot be sterilized except by agents destructive of normal tissues. This is even more true of a tooth in situ, many statements to the contrary notwithstanding. If dentinal and apical cementum cannot be sterilized, and canal medication is worse than useless; if, as shown, very few apices have ever been filled, except by leaking fillings; then all the canal work of this period was useless and all teeth so treated should be periapically diseased.

"Conclusion 6. For the teeth of Classes I, II, III, IV, and V, diagnosed carefully and promptly; if pulps can be removed under as nearly aseptic conditions as possible, by careful chemicomechanical instrumentation, leaving only inaccessible vessels and vital pulp-shreds in the immediate foraminal openings of a vital apex, which has not been cauterized nor over sterilized; or, if these strong agents can be used without their passing out into the membrane (though conservative operators prefer milder medicaments)—if all this can be accomplished without perforation and encapsulation, avoiding infection from debris, then any canal-filling method, as nearly aseptic as can be, that will close these openings well into, but not through, the apex, will insure apices infected as little, and filled as much as possible, and functional teeth [7].

"How are we to distinguish as between the periapically diseased tooth, where this has resulted in the subapical tissues, in touch with the blood stream (Class VI), and the apically well filled pulpless tooth, where it has not occurred (Class V)? The answer lies in correct diagnosis of the apical disease, defining the normality of the attaching tissues, namely, cementum, periodontal membrane and alveoli; all equally as important as, if not more than, the pulp.

"The laminated cementum is built by and in the fibrous periodontium. Both are developed according to age and use. The laminae and fibers of both respond to every stress throughout life by repair, which is not uncommon even in controlled infection. These are no more important, attaching the tooth, than the dense lining of the alveoli known as the lamina dura, see Fig. II, which receives the insertion of the osteal ends of these fibers. If the cells of these tissues lie in physiologic apical contact, attaching a well filled tooth from which the pulp has been removed, that tooth is healthy, no matter whether it be called a 'non-vital,' 'pulpless', or 'dead', tooth (8). When this contact is broken, periapical infection exists beyond the tooth and can best be diagnosed by radiographic study, modified by clinical symptoms. 'Principal among the clinical bony landmarks stands the character and stability of that hard lining of each alvelar socket known as the lamina dura * * * Showing as a dense line surrounding each tooth, uniting with its neighbor to form the interseptal crests, supported by trabeculae, which are important, it defines circumferentially the normal width of the periodontium. Its disappearance in areas, particularly in middle and apical-thirds, with thickening of the dark line representing the periodontium, indicates undue stress or proliferating periodontitis. It may be completely fused in this region by normal cemental repair, or the hyperplasia may progress to a hypercementosis. It is miss-

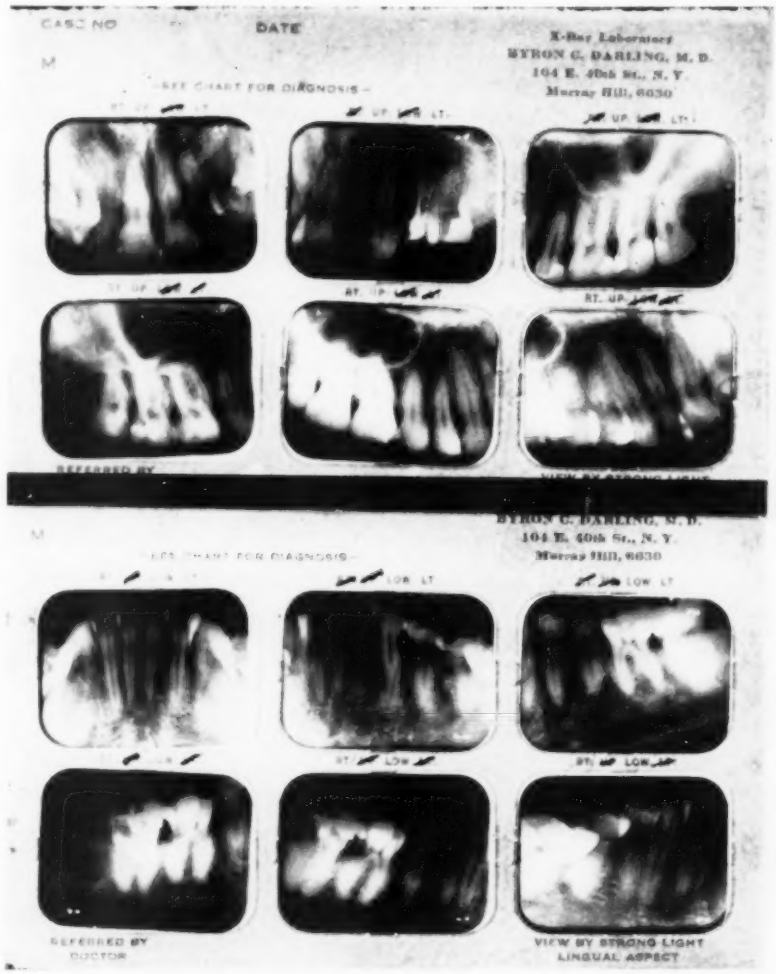

Figure II—The lamina dura is here shown fairly well as the cortex of the socket. In the left upper first bicuspid where the tooth has been treated and there has been cancellated bone restoration the lamina dura has not been restored. According to Grieves this tooth should be extracted.

ing in cemental hypoplasia and denudation, or when the periodontium is destroyed in the midst of suppuration, granulomata, unorganized granulations or cysts. * * * Lack of continuity in the lamina is undoubtedly a most valuable symptom of infection advancing beyond the tooth, and, clinically, if it be intact, the cementum should be considered healthy.'

" 'The radiograph taken and developed according to the latest technique by those familiar with facial and dental anatomy, in form generally of intraoral films, sometimes extra-oral plates, is simply indispensable' [7]. Serious pararadicular disease is occasionally masked by roots paralleled or superimposed on the film; but **periapical rarefaction,** occurring around the apex, is always visible and **diagnostic of a dead apex;** about which the subapical bone can never form, for it is negatively chemotactile. Bone repair and sclerosis may occasionally present as dense a shadow as cortical bone, but the trabeculae and partitions of the adjacent normal bone, to which these should be compared, are missing.

" 'Sequestra occasionally seem more radiopaque than normal bone and rarefactions may result systemically from osteoporosis, osteomalacia, pregnancy, or calcic waste; in fact, many unusual factors may, but rarely do, appear. * * * Exceptional cases cannot be compared with the usual, and should not be quoted, disturbing confidence of honest operators seeking help, nor can they be used by dishonest operators seeking an excuse' [7].

"Conclusion 7. If pulp removal and canal filling can be accomplished according to the conditions specified in Conclusion 6; if the lamina dura is definite, and surrounding bone cancellations appear to be normal, as in adjacent vital teeth; if there are no clinical symptoms and the apex is not hypoplastic, but contains a filling **well into, but not through** it, with no visible open canal beyond; then a pulpless tooth so situated should be retained, as it is functional and harmless.

"Because of inoperable canals and multiple foramina, the superior molars and canines, and the inferior molars, are occasional exceptions to this rule, which should be kept under survey. If periodontal symptoms arise, the affected teeth should be promptly extracted.

"Conclusion 8. General nutrition may be seriously disturbed, and great distress caused the patient, by indiscriminate removal of Class V (apically well-filled) teeth, for diagnostic purpose or because infection is suspected. Such operations are frequently peremptorily ordered by medical men in their anxiety to cure disease and in ignorance of oral pathology. Obviously, such teeth extracted by a dentist, who, if he does not protest or refuse, but operates following a fad or through fear of, or to please, his medical confrere, undoubtedly damages the patient's health and lowers the dignity of his profession.

Class VI.—Infected Teeth; Septic Pulps.

"There is little use in consuming time for a consideration of the teeth of Class VI (infected teeth, septic pulp, involved by periapical disease.) They have been much discussed in former papers Dr. Grieves five papers, [7 9 10 11 12] and are really not worth while, for the reason that no adequate treatment is shown which will certainly cure the **suppurative, granulating,** or **cystic,** phases of apical isease, except surgery. This statement implies recourse to (a) **apiectomy,** which is rarely successful, because the apical section of dentin and cementum, left by the operation, is not sterile, and generally, if such tissues are sterile, apical disease does not exist, hence there is no need for apiectomy; or (b) **extraction,** which obviouslyl destroys the tooth, but does not cure the bone lesions, except when followed by (c) **curettement,** the third and most important surgical expedient.

"A cure of periapical disease may be defined as regeneration of the lamina dura and associated trabeculae, comparable to adjacent areas on vital teeth or other operated areas, following extraction and currettement. It should result promptly (in four months) and the new bone should be deposited to a line the width of other periodontal membranes, in the same mouth, and the tooth must be clinically correct. Such repair is indeed rare. It has been noted occasionally in acute cases, where subapical tissues were sharply infected by acute purulent pulpitis, and were as quickly relieved of exudates by prompt drainage and canal treatment. These cases reverse the rule, which is that of a primary chronic infection, usually followed by an acute secondary parulis or fistulous abscess, associated with a necrotic apex. Any treatment of this latter type seldom succeeds; subapical bone may appear, as if repaired, but soon breaks down, invading a larger area. Hence:

"Conclusion 9. With the exceptions mentioned, all periapically diseased teeth, when clinically and radiographically definite (Class VI) should be promptly extracted and sockets curetted. If there be the slightest question, it is better to err radically, and remove a **doubtful** tooth, than to risk inevitable damage to adjacent teeth, attaching tissues, or the maxillae and possibly the patient's heath.

"Many medical men, principally pathologists, believe the oral focal infection idea to be much overdone. Others do not subscribe to it at all. Whatever the outcome of this disagreement, we conclude as follows:

"Conclusion 10. Dentists generally must surgically remove all such lesions, regardless of whether they be infected or not, because a real chronic bone pathology exists about the tooth and its cell reactions often simulates malignancy —it eventually proliferates, undermining the denture. So, obviously the dentist, quite as urgently as the physician, and certainly the patient, desire prompt action to prevent further bodily invasion.

"The writer (still quoting Dr. Grieves) is just as confirmed a believer in the doctrine that apically diseased teeth (Class VI) are infective foci, which may cause systemic disease, as he is in the fact that **pulpless, apically well-filled,** apically healthy teeth (Class V) do not produce systemic disease and should be retained. The relation of these lesions, to the various systemic diseases with which they are asso ciated, has been discussed in previous papers [9 10 12].

"From an entire **pyorrhetic denture,** undermined and swaying in purulence, to a single locked periapical area walled off by **condensing osteitis** or sclerosis, nature's best protective procedure, is a far cry in pathology; and yet we know the former may do less systemic harm than the latter; just as the hypertrophic pus ton-

sil may not be a focal factor, while the apparently normal tonsil, with its virulent crypt, may be most active.

"The closure of oral infective portals, if attempted at all, should be uncompromising. Only by promptly ruling out all systemic foci will 'the fight long continued against a minute but daily toxic invasion be won; and those principles should be applied equally to all who consult us, either sick or well' [12].

"Quoting Dr. Grieves, 'the dentist who, without medical assistance of the highest order, attempts to distinguish between the sick and well patient, ignores recent experience of the Medical Advisory Draft Boards, where it required ten specialists, of whom one was a dentist, to diagnose an ambulant man, to say nothing of a sick one. The dentist presumes by a glance and a few routine questions to determine, instantly, matters which might keep hospital laboratories busy for days. We dabble superficially in internal medicine, when we do not know the actual etiology of or sure treatment for a single dental disease."

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*—Read at midyear meeting Radiological Society of North America, Boston, June 4, 1921.

DR. A. F. TYLER, Omaha: This subject is so very important that I feel we ought to emphasize the points that have been brought out by the two essayists. When we consider that 90 per cent. of all foci of infection that produce disease in the body are located above the clavicle, we can readily understand the importance of a definite knowledge about the pathology of the teeth and accessory sinuses and tonsils. The radiologist must sit down with the dental anatomy and get a knowledge of dental anatomy and then take up the dental pathology in order to be able to accurately interpret dental radiographs. The chief argument that occurs between the medical radiologist and the dentist is that the radiologist has not had sufficient foundation in dental anatomy and pathology. After that has been done, I think it is highly important for every radiologist to make a physical examination of every mouth of which he makes films of the teeth. He can see if there is pus coming up around the teeth and he can thus tell whether a pyorrhoea is active or quiescent. Another fact is that you never find a periapical abscess at the end of a vital tooth. That means in certain films in which you see an area of rarefication around the tooth without an opaque filling in the canal that you must be careful. Test that tooth for vitality. So important are these facts that it has been our routine to test every tooth for vitality. Another thing is that x-ray plates should be carefully made. Many times infection around the tooth will be on the buccal or lingual sides and we cannot see it unless we take another plate of the tooth at a different angle. Remember, osteomyelitis of the bone of the jaw is no longer a tooth disease and that the area of the disease is always larger than that shown on your x-ray film.

DR. H. A. OSGOOD, Boston, Mass.: Dr. Tyler has brought out some points which cannot be overemphasized. In the past five years we have made over 5,000 radiographic examinations, and it has been shown that rarifaction at the apex is a minor point in diagnosis. A diagnosis is based on the structural changes in the pericementum. These changes are characteristic in a good radiograph. It is possible, for example, to differentiate a chronic abscess from a granuloma by these changes, and on this diagnosis teatment is based. Not one film in fifty, however, shows sufficient structural detail at the apex to make a diagnosis. The tendency is to get beautiful films which do not show line detail. I have been able, with the portable Coolidge tube and the gas tube to take satisfactory films, but have not done so with the larger Coolidge tubes. I believe that if we do take satisfactory films we can make an accurate diagnosis on which the dentist can base his work. Inaccuracy of diagnosis is a chief criticism of dental radiology today, and is largely due to lack of sufficient detail in the radiograph to show the characteristic structural changes on which diagnosis is based. I have seen extracted garnulomata as large as a bean which failed to show rarified areas at the apex, but did show the characteristic markings about the pericementum. Under appropriate treatments it is possible to clear up small granulomata so that several years later nothing can be seen except a very slightly thickened pericementum. I think the pendulum has swung too far toward extraction, and believe that conservative treatment over a perior of time will show that many teeth which we now extract can and should be saved.

DR. M. J. HUBENY, Chicago (closing his part of the discussion): I think Dr. Gerber analyzed a much mooted point when he stated the limitations of the radiogram in acute mastoiditis. A parellel instance might be cited in an acute fulminating case of osteomyelitis of the tibia, clinically well defined, in which, numerous plates are taken and no information yielded.

It is unfortunate that considerable time must elapse between the onset of a disease process and its manifestations on the radiogram. This holds true in the entire domain of medicine, as usually, considerable time does elapse before obvious evidences of morbidity present themselves.

My deductions were derived from clinical experiences and since such important questions as, first, what is the nature fo the infection; second, what is the degree of absorption, can not be predetermined, I firmly believe that more teeth will be extracted in the future than are extracted today and that the acceptance of the radiogram as a final arbiter of dental infection in a negative value will be discarded.

DR. B. C. DARLING, New York (closing his part of the discussion): I appreciate Dr. Tyler's discussion very much. The dentist is passing judgment on the patient's general health as to whether it will warrant his leaving any diseased condition and whether he should go on and treat the large periapical abscess. He is trying to practice medicine to bolster up his side of it. If we try to test the vitality of the teeth I believe we are doing things we ought not to do and trying to practice dentistry.

The Advantages of Using Dixon's Angle of Thirteen Degrees in Examining Accessory Sinuses and Mastoids

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SOON after Caldwell* read his classic paper on the examination of the accessory sinuses there came on the market a wedge-shaped "wooden pillow," based on Caldwell's work and made with a top sloping at an angle of 23° to the base. Pirie** described his method of utilizing this 23° wooden pillow for making mastoid examinations. This pillow has attained wide vogue in America in making examinations of the head.

Dixon conceived the idea of adopting an angle for examining the mastoid bone which would give a constant anatomical landmark, and he made a uniform practice of superimposing the shadow of the external auditory meatus upon that of the internal auditory meatus—the chief advantage of this being that these two shadows determine a vertical anatomical constant connecting these two meatuses from which comparative measurements can be made in each case to determine more accurately the amount of operative latitude there is and still avoid the lateral sinus and emissary veins, and also the nature and condition of the mastoid cells. A plate made at this angle shows the outlines of the ossicles of the ear in the middle of the concentric black circle of the external auditory meatus and the gray circle of the internal auditory meatus. This constitutes a striking landmark which is also exceedingly useful in determining whether the sinus is of the infantile type, whether it is "far forward" or not, as well as orienting emissary veins and determining the type of bone to be encountered.

In order to superimpose these shadows in the normal-shaped head Dixon finally adopted a pillow with its top inclined at an angle of 13° to the base. This "pillow" I carefully copied, but continued to use the 23° angle "pillow" for accessory sinus examinations until one day in a hurry I used the Dixon pillow for both accessory sinuses and mastoids, and was surprised to find in the accessory sinus plates that the shadows of the petrous portions of the temporal bones were cast in the lower portion of the orbits, and the shadows of the antra and ethmoid cells were entirely clear of superimposed shadows of the petrous portion and appeared in continuity with the shadows of the ethmoids and frontals, thus eliminating all extraneous shadows of the petrous portion of the temporal bone from the field of the shadows of the accessory sinuses. So I have come to use one wooden pillow instead of two, because the shadows of the anatomical landmarks when the 13° pillow is used are superior for accessory sinus work as well as for the mastoid work for which it was originally devised by Dixon.

The technique is shown by illustrations (See Figs. 1, 2, 3, 4).

In an intensive surgical study of over three hundred sinus and mastoid cases at the Shurly Hospital in Detroit during the past six months, in which we were able to check up our x-ray examinations by thorough clinical, bacteriologic, pathological and surgical examinations, we have experienced material advantages in using this 13° angle pillow in all our accessory sinus and mastoid cases, as is shown in the accompanying roentgenograms.

The technique for examination of accessory sinuses:—

In addition to the usual technique, the following details should be observed:

1. A lead kit with a round window is placed over the plate to avoid fogging from secondary rays.

2. The x-ray tube is accurately centered in the glass protective bowl.

3. A small cone is used in which the diaphragm opening above is just large enough to allow the direct x-rays to radiate to the periphery of the outlet of the cone; the outlet of the cone is round and conforms to the size of the window in the lead kit, and this is just large enough to give a circular radiograph including the shadows of the accessory sinuses.

4. Two exposures are made in the anteroposterior position, and one in the lateral—the first with the patient in the forehead-nose position on the 13° angle pillow; the second in the chin-nose position on the flat table; the third with the patient in the side-to-side position with the cone centered to show the depth of the portals and the sphenoid cell.

5. After exposure a lead-and-copper disc is accurately centered over the area on which the x-rays have acted; the usual lead numbers and letters are laid on the plate for orientation and for identification, and exposure made in order to put a background on the plate to aid the eye in studying the details of the shadows.

Figure I.—Position of Dixon "pillow," patient and tube in roentgenographing left mastoid region.

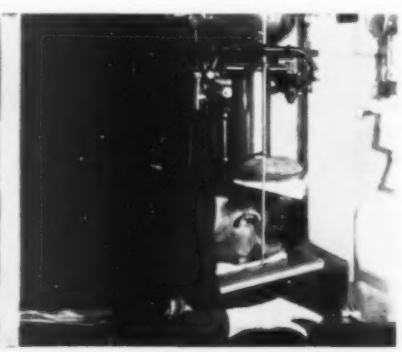

Figure II.—Dixon "pillow" as used by the author in roentgenographing the nasal accessory sinuses.

In making the mastoid exposures the following details are carried out:

1. Lead kits with round windows just large enough to include the mastoid area are used on top of the plates.

2. These plates are placed on top of the 13° angle wooden pillow.

3. The pinna of each ear is held forward by adhesive plaster.

4. Both mastoids are x-rayed on the same plate so that the posterior portions of the mastoid cells are in juxtaposition for easy comparison; that is, the shadow of the left mastoid is on the right end of the plate and the shadow of the right mastoid is on the left end.

5. When making the left mastoid exposure the patient has the right hand above the head and the left hand at the side; when making the right mastoid, this position is reversed. This seemingly trivial detail is very important in order to have the shadows of the external and internal auditory meatuses superimposed.

6. The background of the plate is blocked out in the same manner as described for the sinus plate.

I use the ten (10) milliampere Coolidge tube, or a fine-focussed seasoned gas tube—and either plates or films with intensifying screens.

Figure III.—Roentgenogram of accessory sinuses at angle of 23° showing the shadow of the petrous portions of the temporal bones partially obscuring the shadows of the Antra.

Figure IV.—Roentgenogram of accessory sinuses at angle of 13° showing the shadow of the Antra unobstructed and in continuity with the Ethmoid shadows.

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The Effect of Cellular Reaction Induced by X-Ray on the Fate of Cancer Grafts

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New York City

IT WAS demonstrated in this laboratory that x-ray given in proper dosage was capable of destroying the lymphoid tissue and circulating lymphocytes without inflicting any detectable damage on other tissues or organs. This observation was an extension of the work of Heineke, who showed that the lymphoid tissue suffered more damage after a large dose of x-ray than did other tissues or organs. This method of depletion of the lymphoid tissue gave us a means of determining the functional value of this tissue in various diseases. It was first shown that animals of tested immunity to inoculated cancer could be rendered susceptible by destruction of the lymphoid tissue and circulating lymphocytes. Likewise, natural immunity could be counteracted by the same means.

Further investigation showed that it is possible to induce a marked stimulation of the lymphoid organs and a lymphocytosis in the circulating blood by a properly regulated small dose of x-ray. Animals susceptible to inoculated cancer become highly immune after a treatement of this kind. Furthermore, animals with spontaneous cancers subjected to the stimulating dose of x-ray were rendered relatively immune to replants of their own cancers.

These observations led to a consideration of the part played by these manifestations in the results obtained by x-ray therapy. The point of first interest was to determine the effect of x-ray on the cancer cells in-vitro, eliminating the complicated effect of the rays on the animal body. A rapidly growing mouse cancer was removed and divided into halves. One portion was exposed directly to x-rays in the following dose: Coolidge tube, spark gap eight inches, milliamperes five, distance six inches from target, time two minutes thirty-five seconds, without filters. The tumor was then divided into small bits and inoculated into a number of normal mice. At the same time the control half of the tumor was inoculated into a similar number of mice. After about five weeks one of the tumors arising from the x-rayed portion was removed and half of it exposed to x-rays in the same manner as above and reinoculated into another lot of normal mice. This procedure was repeated about every five weeks for seventeen months. The only effect of this treatment which is well above the therapeutic dosage.

was a transitory reduction in the growth energy and in the number of takes of the x-rayed tumor. Later in the experiment the x-rayed tumor grew as actively and gave as great a number of takes as did the untreated tumor, which was carried in parallel series.

A similar experiment with softer x-ray gave a like result. The dose used here was; spark gap one inch, milliamperes twenty-five, distance eight inches, and time twenty minutes.

At this point in the investigation it became evident that either human cancers of certain types were more highly susceptible to x-rays than mouse cancers, or that there was some explanation other than the direct action of the rays on the cancer cell to explain the satisfactory results of x-ray therapy in human cancer. From an analysis of the results of x-ray treatment of human cancer, it is evident that the superficial growths are the only ones which respond with any degree of uniformity.

The following experiments were carried out to determine whether the location of the new growth was a factor in its response to x-ray and also whether there was any evidence of an indirect action of the rays on the fate of the cancer cells.

Mice were given an erythema dose of x-rays over an area of the abdomen and histological examination made at intervals afterwards. This study confirmed earlier observations, namely that the erythema was preceeded and accompanied by a lymphoid infiltration of the skin layers. This reaction, however, did not extend below the skin and the subcutaneous tissue was free from any cellular infiltration.

A large series of normal mice were shaved over the abdomen and a small area in the left groin was given an exposure of an erythema dose of x-rays. A cancer graft was then inoculated intracutaneously in the center of this area and a like graft was inoculated into the right groin, which had received no x-ray. The result was that practically none of the grafts grew in the x-rayed area, while most of the grew in the normal skin. This experiment was repeated in the same manner with the exception that the grafts instead of being inoculated into the skin were placed in the subcutaneous tissue. Under these conditions the tumors grew equally as well in the x-rayed area as in the normal area.

We conclude, therefore, that the x-ray induces some change in the skin which renders it an unsuitable soil for the growth of cancer. This change is confined to the skin and is not present in the subcutaneous tissue. From our previous studies on the relation of the lymphoid cells to cancer resistance it seems reasonable to suggest the possibility that the lymphoid infiltration resulting from the x-ray treatment is the factor which renders the skin resistant to cancer growth.

The extent to which we are justified in assuming similarities or analogies between the behavior of tissues in man and in the lower forms of animals is a question which can be answered only by further and more extensive experimentation. However, with the evidence presented here, of a cancer which was not killed by a large dose of x-ray given in-vitro, but which will be rapidly absorbed if inoculated into skin which has previously been exposed to a comparatively small dose of x-rays, there is offered a point worthy of consideration in interpreting the results from x-ray therapy.

EDITORIAL

The JOURNAL OF RADIOLOGY

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Annual Meeting

"THE largest meeting ever held!" "The most interesting program!" and many similar expressions were heard from those in attendance at the annual meeting recently held in Chicago.

President Williams deserves the highest praise for his expeditious handling of the many problems presented. His genial smile and witty remarks at critical times put everyone in good humor. The president had the untiring and willing support of every member and officer present. Secretary Sandborn deserves special mention for his organization of the details of registration and his excellent choice of the reporter.

More than one thousand were in attendance, and sixty papers were given in a total session of forty-one hours. The scientific program was full of interest, inclusive, and came from wide sources. The purely physical aspect of deep therapy was presented by such men as William Duane, Ph. D., of Harvard University; Albert Bachem, Ph. D., of Frankfort, a. M.; Dr. Guilleminot of Paris, Henry Schmitz, M. D., of Chicago, and Leo E. Pariseau, M. D., of Montreal.

This work is really the foundation upon which all radiation therapy rests. We think all present realized as they never had the necessity of sweating out the physical basis of deep therapy before building the superstructure of treatment. No two machines behave in exactly the same manner, each has to be standardized, and such facts carry conviction with them. The introduction of the more powerful apparatus for deep therapy treatment brings the realization that coöperation is necessary. Too long have American physicians failed to work in close coöperation with physicists and laboratory workers.

Francis Carter Wood of New York, by showing the necessity of working out a biological method of estimating a standard dosage, coupled up the physical foundation with the clinical use of radiation. He has worked this out through experiment upon a certain strain of mouse cancer known as Crocker Fund No. 180. He selected this particular growth because repeated observations and tests carried through a period of four years have proven that this tumor is stabile, that is, it does not spontaneously regress, but on the contrary, steadily advances ultimately killing the host. This type requires a fixed amount of irridation to kill it, the amount being always the same. The dose, determined by actual clinical test on the human, is six times that required to produce a mild erythema on the skin of the chest or abdomen. Dr. Wood suggested the standardization of every deep therapy machine by the use of this strain of mouse cancer and courteously offered to supply the mice and instructions to any one wishing to make the test. The only condition of this offer is that complete reports be returned to him that he may have data on a large number of tests from widely disseminated sources.

From the pathological standpoint very valuable material was presented by A. S. Warthin, Ph. D., of the University of Michigan. This work is of extreme importance and sorely needed by radiologists because beyond any possible contradiction it proves the action of radiation on various tissues and pathological conditions. The doctor has spent much time and energy on the work thus far and has much yet to do. An exhaustive study has been made of the effects of irridation on the skin- lymph glands, spleen and the thyroid. This work gives definite proof that the cells lose their identity and explode when irridation is carried to the point of distinction and that they are later replaced by connective and fibrous tissue. The detailed description of this work will appear in The Journal soon.

We could go on and on, so much good material was presented, but we must leave it until the papers themselves appear in The Journal.

The joint meeting with the Chicago Medical Society was unusually well attended. A white haired physician made the remark that he had attended the meetings of the Chicago Medical Society faithfully for twenty-five years and that this was the largest crowd he had ever seen. The auditorium in the Marshall-Field Annex Building was filled to capacity and two hundred stood up.

Dr. George E. Pfahler reported his "Results in the Treatment of Cancer of the Lip by Means of Electro-coagulation and Radiation" and showed sixty-five cases well more than five years.

Dr. Russell D. Carman talked about "Errors in the Roentgen Diagnosis of Duodenal Ulcer." He reported 523 cases all submitted to operation, in 520 of which a correct ante-operation diagnosis had been made. Dr. Sippey in his discussion reported that his experience had not led him to think the roentgen diagnosis so accurate as Dr. Carman had stated. It was brought out that the term "peptic ulcer," as employed by Dr. Sippey, was incorrect, as it does not distinguish between the gastric and the duodenal types. Considerable merriment was produced during the discussion by a jovial criticism from Dr. Lewis Gregory Cole, in which he asked Dr. Sippey if he would not feel very happy had he 520 diagnoses out of a possible 523 proven correct at operation.

We want to mention the banquet because of certain events which occurred there. Some idea of the extent of the program can be given by the fact that Dr. Williams had secured sixteen different men to give after dinner talks, and some idea of its character is shown by the fact that the evening passed very quickly.

After brief remarks by the honor men and the president's annual address, Mr. A. P. Johnson, editor of the Grand Rapids News, made an address upon the subject "The Danger Point in Civilization," emphasizing the fact that over-specialization has produced a lack of coöperation and that we should now help the pendulum to swing back the other way.

Following Mr. Johnson came F. C. Warnshuis, M. D., speaker of the House of Delegates of the American

Medical Association, whose subject was "Ideals to be Sought." He plead that individual units of the medical profession work out their own problems through coöperation rather than having outside influences solve their problems for them.

Franklin H. Martin, Secretary of the American College of Surgeons, spoke further about the value of coöperation in medicine and pledged the support of the College of Surgeons to help radiologists solve their problem.

Frank Smithies, M. D., Secretary of the American College of Physicians, went one better by saying that the College of Physicians was already coöperating with the radiologists. We are very happy to claim Dr. Smithies as one of the early members of the Radiological Society, thus giving double proof of his statement.

A. J. Pacini, M. D., formerly Chief of the X-ray section of the U. S. Public Health Service; Russell D. Carman, M. D., head of the Section of Roentgenology, Mayo Clinic, and Albert Soiland, M. D., President-elect, all made brief remarks along the same trend.

The commercial exhibit was large, occupying the entire mezzanine floor as well as a large room across the entire north end. There were thirty exhibitors in all. There was the usual exhibition of diagnostic equipment of all kinds attracting much attention. The greatest interest, however, was manifested in the deep therapy equipment, of which three types were shown, one where a large size single transformer made up the power plant, another where two ten inch transformers were connected in series, and a third where a single transformer was employed and the rectification was made through the neutral leg of the transformer.

This report would not be complete if it did not mention the fact that two hundred and fifty new members were received, giving the Radiological Society of North America a total membership of approximately seven hundred.

The annual meeting in 1922 will be held at Detroit, Michigan, the first week in December. Exact dates will be announced later.

Research Bureau

ONE of the important actions taken by the society was the establishment of a Research Bureau. A committee was appointed to work out the details for the proper functioning of this Bureau. It is not yet known just how the work will be carried on, as sufficient time has not elapsed to permit the formation of a complete plan. We can see several angles of approach, however.

Much research of extreme value to radiologists is now being carried on throughout America. This work as carried on falls into three general groups, viz.: that which is being done by institutions founded and maintained for research work exclusively, illustrated by The Crocker Institute, The Rockefeller Institute and others; second, the research work carried on under support offered by the various universities, such as the work of William Duane at Harvard University, William F. Peterson at the University of Illinois, Professor Ivy at Loyola University, Leonard Loeb at Chicago University, A. S. Warthin at the University of Michigan, H. E. Robertson at the University of Minnesota, and others which do not now come to mind; the third group is composed of those active clinical radiologists who are interested in some problem directly connected with their work, but who must work alone, such men as Henry Schmitz of Chicago, Robert Milwee of Dallas, and Arthur Erskine of Cedar Rapids illustrate this group. Besides these three groups there is the work of the National Research Council and the United States Bureau of Standards, which undoubtedly could furnish much valuable material to the radiologist.

It is hoped that all these agencies can work in a coöperative way to make their work available to those interested. The society should be able to act as a clearing house of information between the research worker and the clinician.

Social Medicine

DR. FRANK BILLINGS of Chicago made fervid appeal to the members of the Douglas County Medical Society at Omaha, Nebraska, the evening of December 13th last, to adopt what he proposed as a constructive program, and which he said, if followed through, would certainly stop all loose talk about the socialization of medicine.

The program which he argued was worthy the serious consideration and the whole-hearted support of the entire medical profession, both through the American Medical Association and the various local societies of medical men scattered broadcast throughout the United States, contemplates that the medical profession shall procure the introduction into, and passage by, every state legislature of an enabling act. That act, it is contended, should be so drawn as to give the people power to tax themselves for the erection of hospitals in any political subdivision (hamlet, town, county or city ward), and for the purchase of laboratory and other diagnostic and therapeutic instruments and supplies. This would have the effect, according to Dr. Billings, of "medicinizing socialization," an expression which must be condemned as being both extremely naive and nebulous.

Viewed from the sociological side as well as the professional side, such a proposition needs very careful analysis and critical study. There can be, of course, no question about the right of the people to exercise this function of the police power of the state if they so choose. But such a method of meeting the issue now confronting the public and the profession, i. e., safeguarding the public health, is one that may well be considered at length in order that we may not all find ourselves in a sorry dilemma later, a dilemma from which it may be exceedingly difficult to extricate ourselves physically, financially, governmentally and morally. If we are to profit at all by the experience of the British public with its panel system of medical practice, or the paternalistic pauperization that has characterized governmental medicine in Germany, or even some of our own experiences in other phases of the socio-economic problem, there is certainly grave question whether the plan proposed offers any real, substantial benefit for the improvement of the present failures of our medical functioning. In any event, it smacks altogether too much of Marxian philosophy to be accepted per se either as an irreducible minimum guaranteeing the public health, or as a quid pro quo to offset the insistent demand of the general public for a more intelligent and accessible medical service.

More than this, it is our own notion that neither the medical profession nor the general public can afford to approach this problem in a controversial spirit or in the attitude of either trying to put something over on the other.

Wherefore, we make bold to say, that if the medical profession adopts this proposal and requires the lay public, through taxation, to provide the working tools of medical ministration, it must be prepared to eat the other and bitter half of the apple, and accord that public the inalienable right to prescribe the conditions under which those working tools shall be used, and the fees which the medical profession using them charges back

to the public in conjunction with their use. That is elementary. Our educational system, the United States Postal Department, and our other governmental agencies are cases in point. The established principles of public policy guarantee this safeguard to the tax paying public.

Anything less than this, any other interpretation of the law, would be in absolute contravention of those constitutional guaranties and inviolable principles on which our government and social institutions rest. To apply any other rule to the medical profession for the purpose of differentiating it from all other socio-economic units would most assuredly open the door to the carpenter, the engineer, the mechanic, the butcher, the baker, and the candlestick maker to demand the application of the same principle in their respective cases, and to insist that the public lay taxes on the wealth and life of the community for the purpose of providing each and all of them with the necessary housing facilities and implements for their particular socio-economic functions. Otherwise, those constitutional guaranties written into the supporting structure of our social and governmental fabric with the sweat and blood of our forbears, would become contemptible scraps of paper. So it is, that such a proposal, consciously or unconsciously, is a plea for class legislation, fathered in bigotry, mothered in iniquity, and conceived in social intolerance.

Dr. Billings is recognized as one of the leading spirits of the American Medical Association. To him is gladly accorded the honor which goes with the deanship of medical opinion. We would not detract a single jot or tittle from either. But we must insist that Dr. Billings has not thought his proposition through to its logical and inevitable conclusion, despite all protestations to the contrary. Being honest with ourselves, however, requires that we perform the unpleasant task of taking issue with Dr. Billings and calling his attention to the indisputable fact that, in making this sort of a proposal, he is, in fact, advocating the rankest kind of state medicine. Certainly, when a number of such institutions as he proposes have been established it will be necessary to coördinate them and govern them, and being publicly or governmentally owned institutions, the logical place for the lodgment of that responsibility would be in the department of public health.

Brushing aside all these fundamental problems, such a proposal is at least an admittance, willy nilly, by a high priest in the greatest organization of medical men on the face of the earth, that medical men as such are not able to stand on their own feet. It is a sweeping denial of all the preachments of self-sufficiency and human service which have been the shibboleth of the medical profession since time immemorial. It is a public confession that the ideals and purposes of the medical profession are inherently so far flung that the medical profession is unable to apply them practically to a human living world and make them minister to a man's man in a man's fashion.

Enough of this. Fundamentally, the weakness of Dr. Billings' position lies in the fact that he, like many other medical litterateurs, has constructed the warp and woof of his vision of the future of the medical science on the restricted notion that preventive medicine, or the question of public health, means nothing more than the exercise of the police power of the state for the protection of its citizens against the overt act of any individual citizen infected with or exposed to communicable disease.

This is the point where we diverge. Preventive medicine means infinitely more than that or it is utterly fallacious and holds no promise of future stability or large social purpose for the medical profession. Preventive medicine must mean more than that, or the public can pin no faith on the science of medicine as a socio-economic agency in the intelligent upbuilding of the public health.

Preventive medicine must mean the science of correct living imparted to the general public in such a manner that that public will know how to safeguard and preserve its ability to do a day's work. Nothing less than that conception will measure up to the standards of the medical profession or the confidence reposed in medical science by men and women who have the will to work, the ambition to achieve, and the desire to procreate.

Others hold somewhat parallel views. Dr. Boyd, professor of bacteriology and preventive medicine for the University of Texas, says:

> "Preventive medicine may be defined as that branch of applied biology which seeks to reduce or eradicate disease by removing or altering the responsible etiological factors. * * * Included within its scope are hygiene and sanitation."

Dr. Dorland, a member of the committee on Nomenclature of the American Medical Association, defines preventive medicine as:

> "That branch of study and practice which aims at the prevention of disease."

These definitions might be multiplied indefinitely, but that would simply be a cumulative effort. Those quoted suffice to prove that preventive medicine has a larger scope than that comprehended by Dr. Billings' plan, or possible of accomplishment by the exercise of the police power of the state, and refute finally, emphatically, and once for all, any assumption that the public health can be made subservient to, or wholly dependent upon any scheme or plan which functions through the police power of any political unit or group of political units.

We have no desire to quarrel with Dr. Billings. On the contrary, it is our earnest hope that this discussion will help to clarify his thoughts, and that in return he will help us to set down in orderly fashion the enormous mass of confused ideas which are bothering us.

To this end, it seems well here and now to suggest that whatever functions the police power of the state enjoys, or may be made to include by future legislative enactments, are incidental to the larger purpose of the medical profession. This brings us to an apparent point of agreement with Dr. Billings, to-wit: that what the medical profession needs now more than anything else, is a social concept of medical practice. Where Dr. Billings' views and our own are diametrically opposed is on the question of method by which that social concept can be created and made to function intelligently for the public good. Though even Dr. Billings leans pretty heavily in our direction, as evidenced by his oft-repeated statement that the medical schools of the present day are not educating medical students in such a way as to fit them for the performance of their professional duties toward the public; and further, by his assertion that the medical profession cannot shift the responsibility for these problems to the public, but must do something on its own account.

Speaking broadly, there are two phases of this part of the subject under discussion which must be made to harmonize in purpose although it may not always be possible to make the successive stages of their development coeval. These are, first, the attitude of the medical profession toward, and its knowledge of, the socio-economic requirements which any organic health program must meet; and second, the measure of voluntary public confidence which can be called

into existence in support of an organized effort to achieve a better public health as a social asset.

In this connection, we are constantly reminded of the wisdom of that Biblical teaching, "Come, and let us reason together." For it must be conceded by all right-minded and thoughtful persons that it is the sheerest kind of nonsense to expect the medical profession to lay down anything like an inclusive or conclusive health program without taking into account all the etiological factors which produce abnormal and unhealthful biological results. By the same token, it is also the sheerest kind of nonsense to expect the lay public to understand and avoid these results unless they are first fully informed concerning the etiology behind them.

More than all this, the general public, as distinguished from the medical profession, is not going to blindly submit to any universal or sweeping reformation of its intimate and personal habits without good cause. Or, stated conversely, the public will insist upon demonstrable and satisfactory evidence of both the feasibility and practicability of any program which strikes at or seeks to elevate the standards of public health.

That is why the proponents of state medicine or social medicine, speaking now of the governmental practice of medicine in whatever form it is proposed or by whatever name it may be called, are so irresistibly funny. They argue that a thorough-going public health can only be achieved by the calendar of governmental power. They seem to have fallen into this specious conclusion as a result of military medicine during the late world convulsion, when the medical staff was able to prescribe hours of work, conditions of housing, dietary measures, prophylactic treatment, vaccination, innoculation, and the Lord only knows how many other restrictions, specifications, and mathematical calculations—all injected into every man's daily routine by the exercise of all the latent energies of a war mad world intent on crushing supermen by the development of greater supermen.

So far as peace-time government is concerned, however, that sort of a scheme is a pure Marxian sophism. It is impossible to escape, though the ardent advocates of state or social medicine always try to dodge, the part the individual man, woman and child must play in any serious effort to improve social standards whether they relate to health or any other specific phase of our existence. That is why it is absolutely impossible to accomplish a universal knowledge of, and obedience to, the science of health by a mere twig of the thumb of the police power of the state. Compulsory rules of conduct, even though they include both the profession and the public, will not, if we understand the principles of American sovereignty, beget a wholesome respect for medical science, but rather will reduce it to the political and social pooh bah state, a thing perhaps to be tolerated as a necessary evil, but never accorded that mass individual support which always characterizes a common cause for a common purpose grounded in intelligence and mutual understanding.

To say, or even to assume, that the nation, whether speaking individually or collectively, can be purged of all its unscientific, inhuman, and unhealthful purposes (concerning many of which the medical profession itself does not now possess specific knowledge either preventively or curatively) by or through the exercise of the police power, is neither warranted by fact, nor justified by the most Utopian dream of the future development of the human race. Men and women are not likely to be re-made over night by a copious physic of health propaganda administered by the medical profession or any other group through the police power.

As we see it, the immediate problem which confronts the medical profession as well as the general public, is a reconstitution of medical practice in order that it may conform to the socio-economic needs, and in order that the medical profession may be enabled to come before the public with clean hands when it asks the support of the public for any program it may have mapped out. Such a reconstitution must of necessity be based on an earnest effort to comprehend the medical profession's job as a socio-economic unit charged with full responsibility concerning the public health, and must call for the intelligent use of the great multitude of agencies already in existence before the public shall be asked to add to the tax budget the cost of others.

The incident which is the subject of this discussion emphasizes and furnishes irrefutable proof of the fact that the medical profession is not now paying the price in mental stress which insures the correct interpretation of the most important phase of development in the history of medical science. It must pay that price or suffer the consequences. It is to the performance of that individual responsibility resting on the medical profession that this discussion is directed. It is to that goal our eyes must turn for the answer to this great question. The ultimate objective of the medical profession can never be attained in any other way.

DEPARTMENT of TECHNIQUE

Protecting the Patient During Prolonged X-Ray Treatment

Charles Goosmann, M. D.

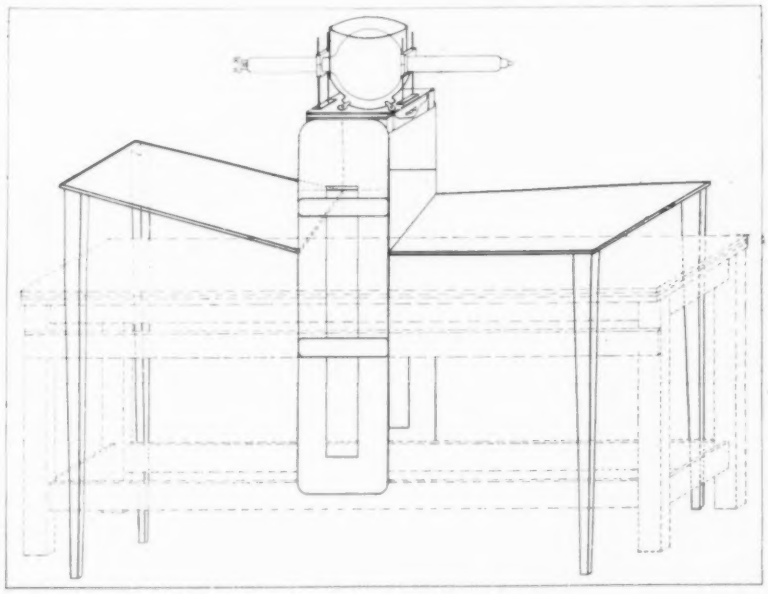
Cincinnati, Ohio

IN giving treatments with the new high voltage technique, I have found it difficult to protect the patient adequately. The heavy covers of leaded rubber are very uncomfortable for prolonged treatments. It has, therefore, seemed necessary to make special provision for this.

As a preliminary trial, I have placed some boards over the patient, the supports for the boards being high enough to prevent touching the patient's body. Any amount of protective material can then be placed on the boards. This has seemed so satisfactory that I am having two tables made for this purpose. Each table will have sufficient width and height to permit it to be moved over the treatment table, after the patient is in position. One of these tables will be shorter than the other, and will have a tilting arrangement, which gives ample space above the patient's head, lessening the fear of nervous individuals.

The accompanying figure illustrates the principle. The treatment table (which has a lead lining on the under surface) is shown in dotted lines; the tube holder and protective table in heavy lines. The illustration is incorrect in giving the impression that the tube holder and protective tables are permanently connected. It is more convenient to have the two protective tables separate, so that they can be adjusted for the treatment of different regions.

After covering the accessory tables with metallic lead, I will use leaded rubber to hang over the edges, so that the patient will be enclosed in a tunnel. Besides the protection from x-rays, this device will lessen the possibility of accidental contact with the high voltage current.



NEW EQUIPMENT

The New Wappler Deep Therapy Machine

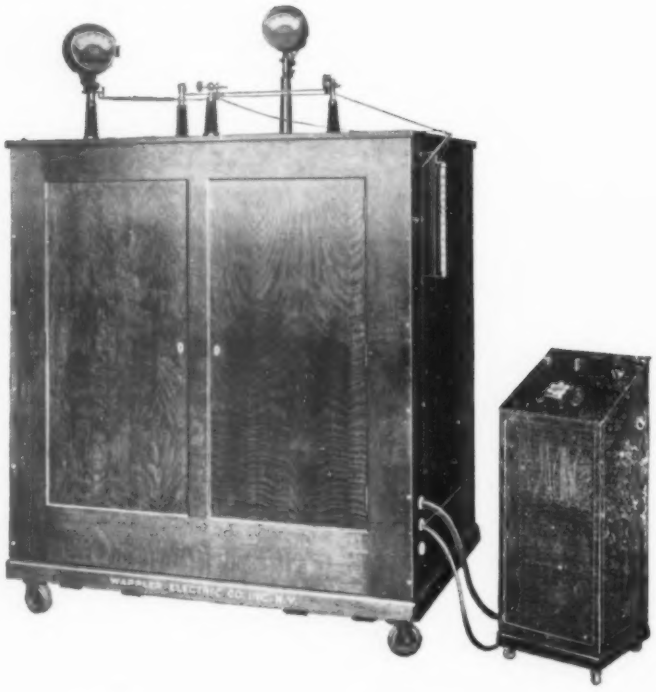
DURING the earlier days of x-ray therapy of deep seated malignant growths, the calculations of dosage and of the most effective voltage were based on the classical absorption law of homogeneous radiations. On the basis of this law the most desirable tube voltage for the effective treatment of deep seated lesions would be calculated to be between 80,000 and 100,000 volts. It is assumed that a more deeply penetrating radiation would not be sufficiently absorbed to be effective, while a radiation which is more readily absorbed may be too injurious to the skin before any effect in the deep is obtained.

Clinical results, however, which recently became available, indicate that much better effects in destroying or inhibiting cancerous growths are obtained when considerably higher voltages are applied to the tube. This apparent conflict, however, was promptly removed when by physical measurement, it was found that the scattering effect of the highly penetrating radiations is primarily responsible for the destructive effect within the tissue. It was determined that from 60 to 80 per cent of the effectiveness of highly penetrating rays in the depth of the body are due to the scattering of the primary rays; and thus the physical measurements are again brought into accord with clinical observations. It therefore seems definitely established at the present day that the very highly penetrating

rays are much better adapted for administering a destructive dose to a deep seated growth, than the rays of comparatively lower penetrative power formerly employed. As soon as this fact was definitely established, new types of x-ray tubes came into the field which are capable of operating with potentials of from 200,000 to 250,000 volts.

The final topic in this problem now is the construction of x-ray apparatus which will produce and rectify a high voltage current up to 300,000 volts, and which is of such construction that it can be run continuously for the long periods of time required for the new method of deep therapy.

The difficulties in generating and rectifying high tension current up to 120,000 volts are too well known to require special mention. Therefore, in order to create voltages which are over twice as high, it would seem impossible to find a solution with the older method.



The Deep Therapy machine of the Wappler Electric Co. is distinctly novel in that it consists practically of two machines connected in series. The two transformers, each of which generates about 150,000 volts are connected in series. The double rectifying mechanism is arranged so that two separate rectifiers rectify independently the current produced in each of the two transformers. The maximum voltage of 300,000 volts which could be applied to the tube, therefore, consists of 150,000 volts negative potential developed in one transformer and applied to the cathode, and 150,000 volts positive potential produced in the second transformer and applied to the anode of the tube. The problem of generating these excessively high voltages is therefore simplified by using the regular well tried type of transformer and connecting two of them in the above described manner.

By decreasing the surface area of the rectifying discs and mounting the discs on insulated hubs, it is possible to drive both rectifying mechanisms with one regular synchronous motor of the size used for the Bellevue machine. The mechanical noise and the air blast produced by this rectifying mechanism are negligible. The size of the deep therapy machine is 38 inches wide, 61 inches long, and 67 inches high.

Another difficulty in connection with this problem is to avoid surges and oscillations in the high tension circuit. Their presence is ordinarily indicated by a distinct flickering of the tube and extensive corona effects along the connecting wires where a distinct humming noise and a large amount of ozone is produced. These harmful effects are eliminated through the use of special grounding resistances which are distributed in the secondary circuit so that the formation of oscillations is prevented. The effects of these resistances in the secondary circuit are brought into evidence by the steady quiet running of the tube and can be demonstrated with a rotating vacuum Glower tube connected in series with the tube. With a properly corrected secondary circuit it is possible to run the deep therapy Coolidge tube continuously with 5—8 milliamperes at 280,000 v. peak value without any signs of strain or flickering in the system. Various observers have remarked that it hardly seems possible that the tube is operating at such high voltage and they expressed great surprise when the current actually jumped a gap of 18 inches, between the usual spark gap points in air.

The Wappler Deep Therapy Machine is now in actual use in several clinics and during the entire day develops and maintains with absolute constancy, currents of the above description. A valuable factor which produces constancy is the Wappler stabilizer, which is embodied in this machine and through which not only the milliampere reading, but also the high tension voltage is kept surprisingly constant. The method adopted in the Wappler Deep Therapy Machine of generating and rectifying high voltage currents appears to be the most logical, and actual experience with this machine in the deep therapy laboratory has proven that this method is undoubtedly the most satisfactory and dependable in actual performance.

Kelley-Koett Magnetic Devices For Tubestand Control in Stereoscopic Work

REALIZING the inconvenience of strings in order to accomplish the necessary releasing of plates and tube stands in doing stereoscopic chest work, the Kelley-Koett Mfg. Company has designed magnetic devices for this purpose. This is a great improvement for this class of work, as the necessary shifting can be accomplished by means of simply pushing a button. This makes it possible to get an instantaneous shift of both tube and plates. It does away with the necessity of having a technician assist in this work. The entire procedure can be done by the operator alone, both shifting and exposure.

This product has been heralded by many of the roentgenologists as an absolute necessity. It can be very conveniently installed by any one. If the tube stand in your office was purchased from the Kelley-Koett Company more than two years ago, it will be necessary to add to the pump shifter of the tube stand the improved release mechanism.

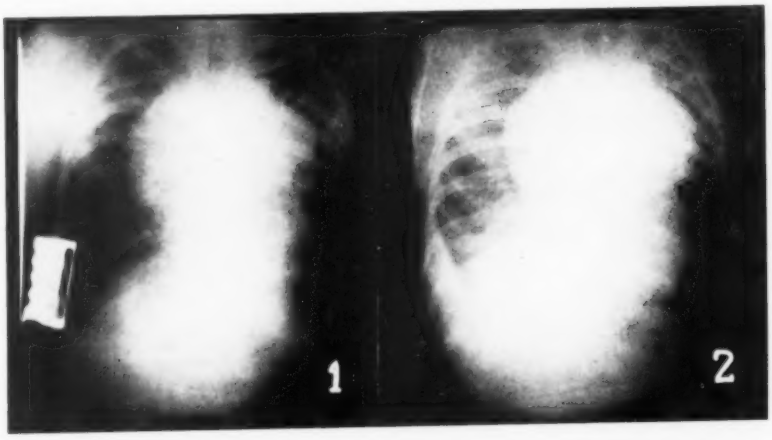
CASE REPORTS

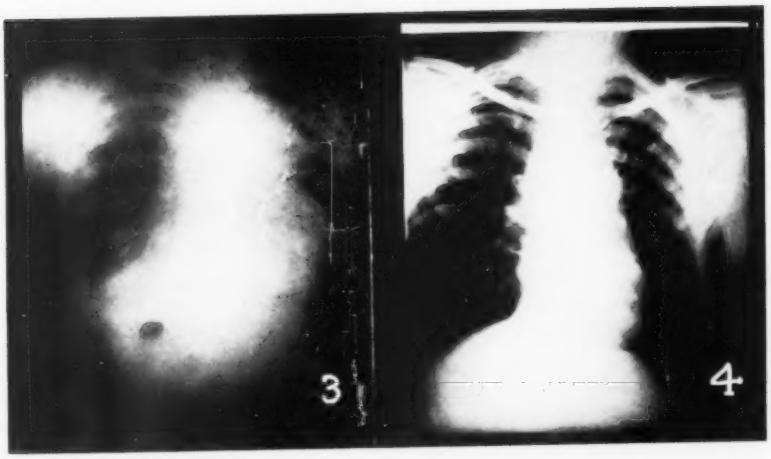
Sarcoma of the Mediastinum, C. H. DeWitt, M. D. Valparaiso, Indiana

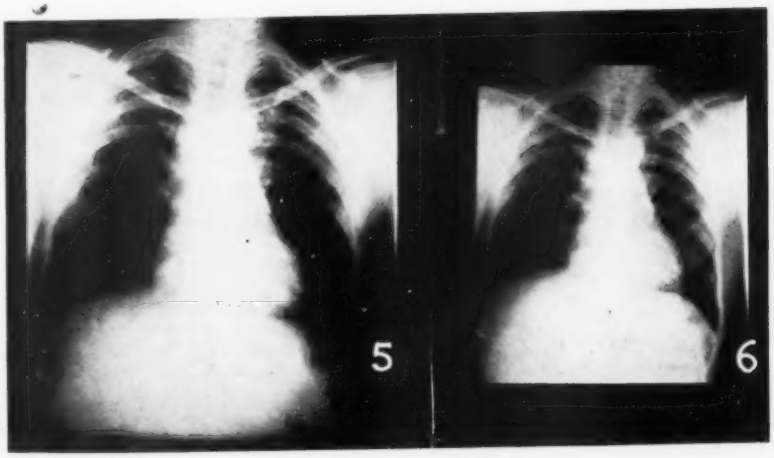
ON January 18, 1921, Mr. R. B. L., a patient of C. O. Wiltfong, M. D., was referred to me for a roentgen examination of the chest.

The clinical findings were those of a marked increase in intra-thoracic pressure as evidenced by marked dyspnoea, a sense of fulness in the upper half of the chest, marked dilatation of the superficial veins of the chest, and the thoraco-epigastric veins, marked edema of the neck and left side of the face, left ear enlarged and cyanotic.

Personal and family history of no importance. He was not able to date definitely the onset of the trouble, but he had had a feeling of distress for some months. He coughed some and raised some mucus.







Physical examination of the chest revealed a downward displacement of the heart toward the left side. A marked area of dullness extended from the episternal notch to the base of the heart, and laterally to the nipple lines.

Blood, urine and sputum examinations were negative.

Roentgen examination: The fluoroscope revealed a tumor filling the upper median portion of the chest, its density being about equal to that of the heart. The tumor was very sharply outlined along its right margin, not so definitely on the left, and pulsation was detected in the left margin of the mass. Figure 1 shows the condition at this time.

I made a tentative diagnosis of aneurism of the arcus aortae with thrombus formation, and although the history was entirely negative, suggested a Wassermann. We secured one report of + + + and four frank negatives from four other laboratories.

The patient consulted a number of specialists in Chicago and in the east without securing a definite diagnosis, or any encouragement as to relief.

He returned to me on February 15, and Figure 2 shows the condition on that date. We now felt sure that we were dealing with mediastinal neoplasm and not an aneurism, and, deciding that roentgen therapy might be of service, I gave the initial treatment on February 19th. His physical condition was such that I did not feel justified in giving a massive dose, and used the following technique for the first four treatments: seven and one-half inch spark gap, four mm aluminum and one-fourth inch sole leather as a filter, ten inch target-skin distance, ninety-five kilovolts, five mm current for twenty minutes. Used four ports of entry, anterior, posterior, and right and left lateral. Treated one area each day. For subsequent treatments I used the same technique, except that one-half mm copper and one mm aluminum was used as a filter, increasing the time proportionately.

Clinical improvement was noted on the fourth day, and from February 19 to April 7, eighteen milliampere hours were given. Figures 3, 4 and 5 show the retrogression of the tumor. Figure 3 was taken March 1st; Figure 4, March 20th; Figure 5, March 30th; Figure 6, taken on May 6th, shows the final result. He has had two treatments since May 6th.

The patient is now clinically well and shows no x-ray evidence of chest pathology. He has gained twenty-two pounds in weight, says he never felt better, and works every day.

While we are unable to make a positive diagnosis as to the pathology in this case, we feel that it is of sufficient interest to report in the Journal. My opinion is that it was a sarcoma, or a lymphosarcoma.

ABSTRACTS and REVIEWS

Further Observations in Roentgenotherapy of the Chest. By W. Walter Wasson, M. D., and Clinical Observations on Roentgenotherapy of the Chest. By James J. Waring, M. D., Denver. Journal of Radiology, January, 1922.

THIS paper describes additional points in technique following observations presented by the author at the annual meeting, 1920.

Fluoroscopic examination reveals the lung adjacent to the heart area with each systole—in diastole it moves away. The movement is transmitted plainly for two or three inches in a wide area around the heart, and less plainly for a still greater distance. This is especially true if disease is or has been present. The time consumes not over one-half second for each movement.

Also in the one-half second during systole one of the bronchi near the heart moves approximately one-half its width toward the heart.

Further observation reveals minute tubercules and other localized areas of disease traversing similar paths to the bronchus. Movement from the auricle is rather imperceptible, from the aorta and great vessels it is quite evident and opposite in time to the ventricle movement. No movement is seen in the peripheral fields, but post mortem reveals here a jelly-like mass which must respond to vibration.

All this is involuntarily movement except that of dyspneic patients and children, and at times the vibration from apparatus.

In chest roentgenography the time must be one-tenth second or less, which is very practical with proper balancing of voltage and milliamperes. The tube must be stable enough to give the desired current at the proper time. The size of the focal spot of the tube indicates ability to focus rays upon a certain density.

A fine point of focus will focus an object five inches from the plate when the anode is twenty-eight inches from the plate. A broad focus tube would need to be nearly forty inches from the plate to sharply outline this same object. A greater distance means loss in power and quality of the rays, therefore longer exposure, more current and a greater strain upon the tube. Chest measurements were begun to find a way to overcome this vicious circle.

The problem was found to be to bring a lung measuring eight inches at its furthest point from the film into sharp relief on the finished film. Even with the sharpest focus tube obtainable there is still two inches of the average posterior lung out of focus. This rather than the amount of tissue is taken by the author to be the reason of the blurring of the film in the case of thick people. Stereoscopic plates aid in seeing the anterior and posterior parts of the lung.

To increase the distance too far at the expense of the time factor is inadvisable. The majority of cases can be covered with very fine tubes at a distance of twenty-nine to thirty inches and the larger chests may be taken on their backs to study the posterior lung fields. This will permit work at one-tenth second or less with no unusual wear upon the tube.

The hilus and portions of the mediastinum show any fibrous or glandular change without confluence of shadows. Study then can be made of any infiltration of hilus blands and spread of infiltration to the adjacent lung.

The bronchial walls and adjacent lymphatics and vessels may be studied. In peri-bronchial thickening in tuberculosis the bronchi show the characteristic sharp, fibrous, beaded outline. In the purulent form of bronchitis the walls are thickened, in the chronic form they are not only thickened, but have hazy, fuzzy outlines. This is also the case in the bronchiectatic form with the addition of localized pockets and dilations in the bronchial lumena. This makes possible an early diagnosis.

Even in the normal lung a very clear view is shown of the bronchioles. It is possible to study any change from the normal. The first change is a broadening of the shadows, with perhaps some beading in the meshes which may extend to the hilus. In the next stage the small beading is more confluent until there is a patch indicating air cell congestion. This is to the roentgenologist what the rale is to the internist. The description is characteristic of some chronic infections rather than very acute ones.

To state that there is interweaving of the terminal bronchi is insufficient as this may come as an extension from the hilum in bronchiectasis. There are similar processes to be differentiated in cardiac disease, dust and chemical inhalation.

Dr. Waring was asked to summarize the internist's viewpoint, which he gave as follows:

It is the wise physician who refuses an opinion, in doubtful cases, without the aid of stereoscopic plates.

The greatest usefulness of the x-ray in diagnosis of pleuro-pulmonary affections lies in the differentiation of borderline conditions.

A tolerably good film of the lungs is worth no more than a tolerably good physical examination. In even the best plates interpretation is difficult, at times impossible. Poor plates lacking definition, not large enough to include the whole chest, not made in the briefest time are worse than useless for wrong conclusions will be drawn. Two cases are cited in the original communication illustrating this point.

The physician needs to be able to interpret his own plates so as not to follow blindly his colleague's opinion —by this is not meant that he should rely solely on his own opinion. A good plate is never in error.

Dr. Warring has found the x-ray most helpful in the following groups of cases:

1. In the diagnosis of frank pulmonary disease to assist in the determination of its tuberculous or non-tuberculous nature.
2. In the diagnosis of suspected pulmonary disease.
3. In manifest tuberculosis to determine its location and distribution and to assist in arriving at a prognosis, and as a general guide in handling the case.
4. In diagnosis of certain pulmonary complications, e. g., pneumothorax, effusion.
5. As a routine preliminary to artificial pneumo-throax and in the subsequent care of these cases.

The Effect of Cellular Reaction Induced by X-Ray on the Fate of Cancer Grafts. By James B. Murphy, M. D., and Raymond G. Hussey, M. D. From the Rockefeller Institute of Medical Research. Journal of Radiology, January, 1922.

X-RAY in proper dosage in this laboratory was demonstrated to be capable of destroying lymphoid tissue and circulating lymphocytes without damage to the other tissues.

Natural immunity and immunity to innoculated cancer in animals was overcome by destruction of lymphoid tissue and circulating lymphocytes.

Animals susceptible and those with spontaneous cancer became immune to innoculated cancer after a properly regulated dose of x-ray which stimulated the lymphoid organs and produced lymphocytosis in the circulating blood.

To determine the effect of x-rays on cancer cells in-vitro a rapidly growing mouse cancer was used to innoculate a series of mice. One-half of this cancer was first treated with x-ray, the other half used as a control.

The final conclusion reached from these experiments was that either human cancers of certain types are more susceptible to x-rays or else that there is some other explanation than direct action of the rays on cancer cells to account for the satisfactory results of x-ray therapy. Superficial growths are the only ones that respond with any degree of uniformity in the x-ray treatment of human cancer.

Further experiment with mice led to the conclusion that x-ray produces some change in the skin which renders it unsuitable soil for the growth of cancer. This change is confined to the skin and is not present in the subcutaneous tissue. From previous studies of the authors it seems reasonable to suggest the possibility that the lymphoid infiltration resulting from the x-ray treatment is the factor which renders the skin resistant to cancer growth.

Further and more extensive experimentation is required before data secured by experimentation with lower forms of animals can be used as a basis from which to draw conclusions in regard to the human, but with the evidence presented here of cancer which was not killed by a large dose of x-ray given in-vitro, but which was rapidly absorbed when innoculated into skin previously exposed to a comparatively small dose of x-ray there is offered a point worthy of consideration in interpreting the results from x-ray therapy.

Homogeneous Radiation of the Chest. By Arthur W. Erskine, M. D. Journal of Radiology, January, 1922.

THERE are cases of cancer of the breast which recur after retrogression of growth and general systemic improvement have taken place, the patient finally dying from recurrence, or from extension of the disease into the mediastinum or lung.

Since a sufficient amount of x-ray caused the disappearance of the growth it is probably proper to assume that if all the mediastinal glands and all parts of the lung received approximately the same dose as the growths underneath the skin progress of the disease would be completely stayed.

Radiation of the chest then is desirable and the problem is to determine the combination of anode skin distance, size, and number of fields, voltage and filters to produce the most homogeneous radiation.

The average surface depth distance in one hundred cases of women was found to be four centimeters.

The size of the fields and the anode distance must be considered together. A full depth dose is possible by radiating the chest through many small fields, which has however the following disadvantages—the center of the field is the base of a pyramid of tissue which receives progressively smaller percentage of the skin dose as depth increases; the corner of a field where it adjoins the three adjacent fields is the apex of a pyramid which a short distance under the skin receives almost four times the skin dose; there is danger of overlapping areas and of leaving untreated strips of surface between areas.

If, in treating four areas, instead of exposing each one ten minutes at a distance of eight centimeters they are all exposed forty minutes at a distance of sixteen centimeters the skin dose will be the same, also the total amount of radiation received by the body. This will be more evenly distributed and there will be a substantial drop in surface depth ratio. Data of Friederich and Kroenig show that there is a further increase in the depth dose when large fields are used and the author's experience corroborates this.

Trial shows the proper anode-skin distance to be sixteen centimeters which will radiate a circle ten centimeters in diameter.

Exposure of the half chest is made in four planes.

The problem now is to find the combination of voltage and filters that will deliver at least one-fourth of the surface dose to the center of the chest so that the sum of the four depth doses will equal one skin unit.

A crude electroscope was constructed to determine relative measurements of intensity.

By experimentation with a phantom with the same absorption value as the living chest the conclusion was drawn that at least one hundred kilovolts should be used and that the rays should be filtered through ten millimeters of aluminum or one-half millimeter of copper.

The author's thanks are expressed to Prof. L. B. Loeb of Chicago University and to Prof. L. D. Weld of Coe College, who offered helpful suggestions as to the measuring apparatus, and to Mr. Edward M. Smith for assistance in taking the readings and arranging the data.

The Advantages of Using Dixon's Angle of Thirteen Degrees in Examining Accessory Sinuses and Mastoids. By Arthur F. Holding, M. D. Journal of Radiology, January, 1922.

THE author had been using the pillow adopted by Dixon, with its top inclined at an angle of thirteen degrees to the base, for mastoid examinations and had continued to use the twenty-degree angle pillow for accessory sinus examinations until one day when in a hurry, he used the Dixon pillow for both and was surprised to find in the accessory sinus plates that the shadows of the petrous portions of the temporal bones were cast in the lower border of the orbits, and the shadows of the antra and ethmoid cells were entirely clear of superimposed shadows of the petrous portion and appeared in continuity with the shadows of the ethmoids and frontals, thus eliminating all extraneous shadows of the petrous portion of the temporal bone from the field of shadows of the accessory sinuses. The pillow is superior for accessory sinus work as well as for the mastoid work for which it was originally devised by Dixon.

The technique is shown by illustrations as well as described in the original article.

In an intensive surgical study of over three hundred sinus and mastoid cases at the Shurly Hospital in Detroit material advantages were experienced from using this thirteen degree pillow in all accessory sinus and mastoid cases.

Dermoid Cysts in the Thorax, with a Review of the Literature. By John T. Murphy, M. D. F. A. C. P. Journal of Radiology, January, 1922.

DR. MURPHY gives a detailed history of a case of tumor mass in the upper chest, evidently connected with the mediastinum. The patient was a girl of thirteen years.

Diagnosis was: Tumor of the lung—probably a dermoid—with involvement of the cervical cord, caused either by direct pressure or metastasis.

No evidence of rupture of the tumor was seen at any time and the patient experienced but little pain during the entire course of the disease. Confirmation of the diagnosis was not possible because post mortem was refused.

Review of the literature on dermoid cyst in the thorax gave a history of one hundred and twelve cases, the majority of which occurred between the ages of twenty and thirty years. No case exceeded fifty years of age and the sex of the patients was about equally divided.

Dermoid cysts have been found occupying all portions of the thoracic cavity and have had their origin near the upper portion of the sternum. The explanation for this fact may be that in embryo, during coalescence of the widely separated halves of the sternum, a piece of skin may become sequestrated and then become dislocated forward to the outer surface or backward to the mediastinum, giving rise finally to a dermoid cyst in the thorax.

These tumors may cause a pleurisy and an exudation resembling pneumonia, or multiple cysts may form and resulting inflammation and pressure may cause erosion of the lung, rupture into a bronchus, erosion of a blood vessel, etc.

Dermoids in the thorax may be simple dermoids or complex tumors. There is authority for saying that most dermoids are of the tridermal type. One solid dermoid tumor of the mediastinum has been reported.

The symptomatology of the dermoids is of two distinct types; the simple dermoid causing symptoms by its presence and the cyst becoming an active irritant.

The size, dullness over the location, bulging of the supraclavicular space, fixation of the ribs during respiration, absence of breath sounds and increase of voice sounds, hair and sebaceous matter in the sputum are all diagnostic. Differentiation from lung abscess, tuberculosis, aneuryism, and empyema must be made.

The usually rapid course of malignant tumors is an important point in diagnosis, though a dermoid when infected may grow as rapidly and early symptoms have escaped notice.

A differential diagnosis from benign tumors of the thymus and lipoma, also intrathoracic goiter is difficult.

Some cases will run long periods. Hemorrhage, and dyspnea, is a common cause of death. Size of the tumor, situation and reaction changes in and about the tumor are determining factors in prognosis. In most cases life is endangered unless surgical removal takes place.

The Rationale of Radiation in the Female Pelvis. By Albert Soiland, M. D., Los Angeles, Calif. California State J. M., November, 1921, p. 434.

THE author does not dispute that inefficient radiation may stimulate cancer cell growth, but states that there is no doubt that radiation properly administered destroys both nucleus and cell body of any tissue exposed to it.

After correct diagnosis has been made the rationale of radiation demands sufficient energy of radiation to obtain the best results in the shortest possible time.

Radium is practically a specific in cases of uterine hemorrhage of all sorts. Age limitations may be disregarded. In some cases intrauterine radium radiation plus deep Roentgen

radiation brings quicker results. A twelve-hour application of twenty-five milligrams of radium in the uterine canal repeated once or twice within a period of six weeks is recommended.

All cases which are favorable operative risks should be given the benefit of the best surgical skill. Cure is impossible when diagnosis of cancer of the uterus is unmistakable, but relief may be secured through radiation.

The author believes cure is possible in some cases of carcinoma of the cervix if all malignant cells are destroyed before the glandular tissue has become invaded. His technique consists of implantation of fifty milligrams of radium element, with a filter of one-half millimeter of silver, one millimeter of brass, and one millimeter of hard rubber, for fifteen hours, giving four such applications within six days. This treatment will destroy all malignancy within a radius of three centimeters from the center of application. This is followed by x-ray radiation over the lower abdomen through four ports of entry, giving a total of six hundred milliamphere minutes in a period of six days.

The technique is practically the same in treating cancer of the body of the uterus, except that radiation is carried up to the fundus if possible. If this is not possible then radium is packed in an additional two millimeters of hard rubber filter, the rectal wall is protected with two millimeters of lead and the mass inserted into the posterior culdesac. Additional tubes are placed in each fornix and exposure is carried to six thousand milligram hours within six days time.

In malnutrition, anemia, tuberculosis, etc., where permanent or temporary sterilization may be desired, intelligent radiation is valuable and the best method to use. Chronic oophoritis, leukorrhea, and pruritis vulvae are usually amenable to radiation.

Radium has proven itself of undoubted value in uterine carcinoma, but the extravagant claims made by European clinicians should not be accepted until proved.

The surgeon and the radiologist should coöperate in cases of uterine cancer.

The Immediate Effects of X-Rays on the Blood Lymphocytes. A Critical Study by Archibald Leitch, M. D., Director of the Research Institute of the Cancer Hospital. From Archives of Radiology and Electrotherapy, London. September, 1921, p. 122.

DR. LEITCH differs with the views of Dr. Russ, as expressed in his paper in the Lancet (April 26, 1919, p. 693). Dr. Russ, as the result of experiments carried out on rats, found the lymphocyte count to diminish fifty per cent on the average with exposure of the animal to x-rays.

Dr. Leitch repeated the same kind of experiments with the result of forty-six per cent diminution of lymphocytes in one rat and sixty-two per cent in another.

Believing it to be a risky thing to argue from an animal of one species to that of another Dr. Leitch also experimented with human subjects. The clinical diagnosis in these was as follows: lymphadenoma, inoperable mammary cancer, lymphadenoma, tuberculous sinus of the abdominal wall, and one normal subject. The doses were the usual therapeutic doses. Blood was examined immediately before exposure and from one and one-half to three and one-half hours after exposure to x-rays. No subject had undergone treatment less than a month before the experiments.

The first two cases showed no diminution in the number of lymphocytes, rather an increase, which was, however, within the allowance for error in random sampling. The third case showed an increase beyond this allowance, but still a normal physiological variation. The fourth showed a diminution of lymphocytes of no great degree, the fifth a diminution of twenty-six per cent. This last subject was a very nervous type who was highly excited and unstrung by the simple technique of the blood test.

It is known that there is a continual loss of lymphocytes through the intestines and the effect of fright and nervousness on the intestines is also known. It is probable then in this fifth subject the normal loss of lymphocytes through the intestines was increased because of her nervous reaction.

Dr. Leitch again experimented on rats, doing away with the x-ray exposure and as far as possible doing away with the element of fright. One rat showed an increase in the number of lymphocytes and one showed a decrease of twenty-six per cent.

To avoid the element of personal bias a series of experiments were run in which blood samples of rats were tested before and after exposure to x-rays, but the identity of the rat exposed was unknown to the one making the count. In each case the x-ray apparatus was kept in operation, but in some cases the radiations were excluded. The treatment and results were as follows:

Treatment	Difference in lymphocytes
Lead screen interposed	—29%
X-ray tube cut out	—28%
X-rays four minutes	—69%
X-ray tube cut out	—57%
Docile rate, tube cut out	—15%
Nervous rate, x-rays two minutes	—64%
Docile rate (same as above) x-rays two minutes	—39%
Nervous rat (same as above) tube cut out	—59%

The data for the last two items were secured two days after the previous experiments.

The conclusion reached is that the diminution in lymphocytes is due to fright reaction and not to radiation.

Dr. Leitch disagrees with Dr. Russ in his view with regard to the effect of radiation on lymphocytes and also disagrees with him in his view of the defensive role played by the lymphocytes in malignancy. The evidence of this defense is not only not conclusive, but very questionable.

The Immediate Effect of X-Rays on the Blood Lymphocytes. By Prof. S. Russ. Archives of Radiology and Electrotherapy, Oct., 1921, p. 146.

PROFESSOR RUSS makes reply to Dr. Leitch taking exception to the conclusions drawn by the latter.

The length of time for a rat to recover after exposure to x-rays Prof. Russ finds to vary with the length of time of exposure. If exposure lasted twelve minutes recovery takes place within twenty-four hours, but if exposure lasts thirty minutes recovery takes from two to three weeks.

This interval of recovery he considers a safer indicator than blood counts as to the degree of disturbance caused by x-rays. Were this disturbance due to a fright reaction he thinks such rational association between the time of exposure and time of recovery would not exist.

Prof. Russ tried the experiment of excluding the rays by means of a lead covering. Ten rats were exposed for two minutes to loud sparking from the spark gap, but all rays were excluded from the experimental box. Then ten other rats were given a real exposure for twelve seconds. Blood counts were taken before and after on each of the rats and the percentage of lymphocyte changes were as follows:

Rats not exposed to x-rays		Rats exposed twelve seconds to x-rays	
Rat No. 1	+69	Rat No. 1	—62
" " 2	+64	" " 2	—62
" " 3	+32	" " 3	—57
" " 4	+16	" " 4	—56
" " 5	+13	" " 5	—55
" " 6	+10	" " 6	—54
" " 7	+ 8	" " 7	—54
" " 8	no change	" " 8	—43
" " 9	—13	" " 9	—34
" " 10	—40	" " 10	—33

The conclusion drawn is that the fifty per cent lymphocyte reduction is a real x-ray effect.

The contrast afforded by the five rats used in Dr. Leitch's experiment may be due to the fact that those used by Prof. Russ were bred in the laboratory and therefore very tame.

Prof. Russ inquires into the proof which Dr: Leitch adduces that the reduction in the number of circulating lymphocytes is due to fright reaction.

Treatment of Ringworm of the Scalp by the Roentgen Rays. By Howard Fox, M. D., and T. B. H. Anderson, M. D., New York. Jour. A. M. A., October 22, 1921, page 1302.

ONE of the many benefits of the discovery of the roentgen rays has been to solve the problem of the treatment of ringworm of the scalp. Sabouraud expressed the opinion that no antiseptic would ever be discovered to cure ringworm of the scalp, because the root of the hair being inaccessible to antiseptics no antiparasitic remedy could penetrate the follicles to any extent as long as the hairs remained. Mechanical removal of the hairs was unsuccessful in ringworm. The solution of the problem was first suggested by the experience in 1896 of Freund & Schiff, who observed the fall of hair in a nevus they had treated with roentgen rays. The attempts to elaborate a technique for

the treatment of ringworm were unsatisfactory until 1904, when Sabouraud and Noire were able to announce the cure of 100 cases of ringworm by a safe method of treating each infected patch with a single application of measured roentgen rays. The entire scalp was exposed piecemeal over ten to twelve areas, the procedure requiring from three and a half to four hours. On the eighteenth day, the average time for the fall of hair, the scalp was washed and any remaining hairs were mechanically epilated. The head remained bald for two months, after which first downy and then normal hairs made their appearance.

The second important advance in ringworm therapy was made by Kienböck of Vienna, who devised a method by which the entire scalp could be irridated at five separate points. This was adopted, improved, and popularized in England by Adamson.

The introduction of the Coolidge tube made possible a third improvement.

Briefly, it may be said that a definite quantity of ray may be given by proper control of the following four factors: milliamperage, spark gap (representing voltage), time and distance (from anode to skin). By means of a formula these factors can be changed when it is desired to modify the time of exposure, distance, etc. The method dispenses entirely with the use of pastils, is extremely simple and requires only reasonable care in its application and in keeping the apparatus in good working order (special attention being paid that the milliamperemeter functions properly). The dose that is given to cause epilation is the equivalent of one Holzknect unit with pastil at skin distance, or four Holzknect units with pastil at mid-distance, or the equivalent of eight units of the Hampson scale.

In the authors' work with ringworm they have used a standard roentgen ray apparatus with Coolidge tube, interupterless transformer, etc., and have followed MacKee in adopting the modified Kienböck-Adamson method. The hair begins to fall during the second or third week, when the scalp is washed daily and a five per cent ointment of ammoniated mercury applied to kill the spores on the falling hairs and prevent reinfection. The roentgen rays merely cause epilation and are not parasiticidal in the slightest degree. The authors have separately treated a total of ninety-eight cases and feel satisfied as to the efficacy and safety of the method. Sixty-three of the ninety-eight cases were treated at Ellis Island. Thirty-four of these have not been long enough under observation to judge of the ultimate result. Of the remaining twenty-nine, twenty-three were treated by the ray alone, and one by manual epilation after the return of the hair, while five were failures. Before being certified as cured the Ellis Island patients were subjected to rather a rigorous test.

Since 1904 a large number of cases of ringworm of the scalp have been treated, particularly in France and in England, by the roentgen rays. Adamson reported the treatment of seventy-five cases with perfect results. MacLeod from an experience of three hundred and seventy cases considers the roentgen rays the most rapid, effective and painless method of curing the disease. Ceresole, in Italy, reported a series of one hundred and thirty-seven cases treated with most satisfactory results, ninety-four per cent being cures, with not a single case of radiodermatitis. MacKee in 1915 stated that he had employed the modern method of treatment for over eight years with only two bad results. In one case the hair failed to grow in one area, in another the hair remained sparse in two areas. He condemned the old divided dose method, saying "it is only employed now by those who cannot or will not modernize their technique. Dr. MacKee in a personal communication states that "over one thousand cases have been treated in Dr. Fordyce's clinic without the use of pastils. As far as I am aware there has never been a case of permanent alopecia. Reinfection and recurrence amounted to about five per cent."

The single dose treatment has now been in use for seventeen years. Cases previously requiring two years for treatment are now cured in three months.

In proportion to the large number of cases treated the amount of permanent damage has been extremely small. The possible danger of brain injury has proved by long experience to be wholly imaginary. MacLeod said "I have been unable to obtain any definite evidence of injury to the brain by this method of treatment from my own cases, from the literature on the subject or from any one with experience of this treatment; and the experiments I have done in this connection strongly negative the possibility." Sabouraud at first refused to treat children under two years of age, but later treated many infants of two years "always without ill effect."

CONCLUSIONS

1. From both a theoretical and a practical standpoint, the best treatment for ringworm of the scalp is by means of the roentgen rays.
2. With our present knowledge of exact measured dosage, without the use of pastils, the method is easy to learn.
3. With reasonable care it is safe, rapid and efficient.

The Therapeutic Aspect of Irridation in Superficial Malignancy. Albert Soiland, M. D., Los Angeles, Jour. A. M. A., November 12, 1921, page 1560.

THE great majority of medical men have accepted and placed a personal valuation upon this agency of healing in proportion to their individual knowledge of its potency, but nothing like unanimity of opinion exists in regard to its applicability to given conditions.

The author in this discussion considers alike irridation from both the roentgen rays and radium. He employs them in similar wave length, so far as is possible to secure this result. All soft rays are screened out, only hard beta and gamma rays are employed, and the two sources of radiation are used conjointly.

There is ample and irrefutable evidence that cancer cells may be completely destroyed by irridation, without any injury to overlying normal cell structures.

The rationale of treatment then is to ascertain the extent and exact location of a cancer area, and to apply to this sufficient irridation to kill every pathologic cell within this field—a single cancer dose if possible. One must distinguish between an erythema dose and a cancer dose. An erythema dose, obtained with a gamma ray, may be an efficient cancer dose, but an erythema dose administered by soft ray technique may actually promote cancer cell proliferation. This while not proved is a decided possibility.

Cancer of the lip calls for more than ordinary good judgment in treatment; primarily a superficial lesion and its close association with the oral lymphatic channels soon converts it into a metastatic and generalized cancer unless initial treatment succeeds. It is of the utmost importance to lay down a radiation barrage which shall include every gland-bearing area in the jaw and neck letting not a single malignant cell escape. Lesions around the eye or the nose grow by extension and rarely metastasize.

Great care must be exercised when exposing skin areas overlying bone and cartilage, but with properly regulated dosage these may be safely treated.

In treating plantar warts one should be sure that a sufficient time has elapsed between treatments to avoid resultant ray necrosis.

Irridation applied to keratotic and seborrheic patches is justifiable, but many of these yield readily to simple therapeutic measures.

Many surgeons rightly feel that cases are often irridated which could have been treated more readily surgically. Surgery is rarely required in the cases enumerated, but in plastic or reconstructive work it should always be given first consideration. The habit of cutting out a piece for diagnostic purposes is a malicious one.

The attitude of a number of medical men who look upon radiology as a sporting proposition is very unfortunate. He who deals with radiation soon realizes that he has to do with a two edged sword, which he must either carefully lay down or else learn to use in a manner to insure his own self respect and to benefit his patients.

The modern radiologist does not hesitate to affirm that his method has accomplished more than any other medicinal agent to combat these unsightly and serious lesions.

A Warning Against Extravagant Claims for X-Ray Treatment of Cancer. Illinois Medical Journal, November, 1921, page 419.

THE Council of the British Association for the Advancement of Radiology and Physiotherapy have issued a statement to the effect that in view of the publicity that has been given to radiotherapy in the treatment of cancer by the publication of laudatory articles in the medical and lay press, and the extraordinary claims that have been put forward by the West London Hospital, it seems advisable

that a considered statement on the use of these agents should be made. The treatment referred to has not yet been thoroughly tested, has great potential dangers, and may not prove as efficacious as the claims now made would suggest. The unwarranted laudation of this change in technique will probably lead to a reaction, and bring discredit upon x-ray treatment in general. The claim put forward by the Erlangen School is that by means of their special methods it is possible to administer a dose of x-rays which will cure cancer in one application. Caustic comment by the Lancet is made mention of, in which it states that the undoubted good accomplished by x-rays in the cancer field cannot help but be lost sight of if extravagant claims, impossible of fulfillment, are given continued publicity.

Intra-cranial Complications of Nasal Accessory Sinus Disease—A Report of Sixteen Cases. By C. F. Yerger. Illinois M. J., November, 1921, page 395.

INTRA-CRANIAL complications of the sinusitis are much more frequent than is generally supposed. The author's material was secured from observations made on sixteen cases selected from three hundred and ninety cases of sinusitis occuring in Cook County Hospital from 1911 to 1920.

The three hundred and ninety cases were of both the acute and chronic varieties. The frontal sinus was involved in one hundred and eighty-seven cases, or 48 per cent. This high percentage being due to the fact that the majority of these cases were of the acute type and diagnosis was made symptomatically and without recourse to the x-ray in about one-half of these. The maxillary was involved in one hundred and forty-seven cases, or 38 per cent; the ethmoid in forty-eight cases, or 12 per cent, and the sphenoid in nine cases or 2 per cent. A low percentage of sphenoid sinusitis is to be expected because this is the sinus least often affected and because of the technical difficulties of diagnosis.

Of these three hundred and ninety cases sixteen had intra-cranial complications. The frontal sinus was involved in nine, or 56 per cent; the ethmoid in nine, or 56 per cent; the sphenoid in five, or 31 per cent; and the maxillary in two, or 12 per cent. In eight cases, or 50 per cent, more than one sinus was involved. In four cases, or 25 per cent, the frontal and ethmoid sinuses were involved. In two cases, or 12 per cent, the ethmoid and sphenoid were involved and the same figures apply in cases of the frontal, ethmoid and sphenoid.

In order of frequency the complications ranged as follows: sphenoids, 55 per cent; ethmoids, 19 per cent; frontals, 5 per cent; and maxillary sinuses, 1 per cent.

The sphenoid sinus, though less frequently diseased gave the highest percentage of intracranial complications, while the maxillary sinus gave complications in only one per cent. This latter fact is due to the anatomical fact that unlike the other sinuses it does not come into direct communication with the floor of the cranium and infection from it must come through the orbit or through the ethmoid.

Diffuse purulent lepto-meningitis was the most frequent complication, occurring in fourteen of the sixteen cases. No case of thombosis of the cavernous sinus was found. Six cases were operated upon, of which four developed meningitis, probably as a post-operative complication. Two were modified Killian operations for chronic frontal sinusitis, one an exenteration of the ethmoid, and the other an operation on the sphenoid, ethmoid and frontal sinuses with orbital abscesses.

Detailed histories of three cases are given in the original communication.

The Radiographic Evidence of the Influence of Cod Liver Oil in Rickets. By E. A. Park and John Howland; Harriet Lane Home and Department of Pediatrics, Johns Hopkins Hospital. From the Bulletin of the Johns Hopkins Hospital, November, 1921, page 341.

UNTIL recently cod liver oil was regarded by the authors as of some value in rickets, but was by no means regarded as a specific.

In the experimental studies the children were maintained upon the same diet as that upon which rickets developed, chiefly milk and cereal. The amounts of oil given varied from two to four cc. per day. Diagnosis was made by physical examinations and radiograms.

The criteria for diagnosis is found in the shaft and at the extremities of the bones. To the extent that the inorganic material in the bone becomes reduced the shaft is less capable of casting a shadow. The configuration of the shaft will vary according to the duration of the disease.

In normal bone the transition from shaft to cartilage is abrupt, the end of the bone being sharply outlined. In the diseased bone this formerly sharp outline becomes indistinct and as the case reaches an advanced stage a fringe develops sometimes several millimeters in length. The normal cupping at the end of the shaft is absent, sometimes no enlargement at all being apparent. This is due to the absence of inorganic material to cast a shadow and not to the entire absence of bone. If the rachitic process is extensive an abnormal distance will seem to separate the bones.

After treatment by cod liver oil changes are detected by the radiogram at the end of three to four weeks. The deposition of salts must have begun some time before they could possibly be detected by the radiogram. In two post mortem cases, one at six days after treatment had been begun, and one twelve days after treatment had been begun there was no microscopic evidence of calcium salts. The duration of the disease previous to the time of treatment may have some bearing upon the length of time taken to produce evidence of deposit.

At the end of two to three months calcification of the ends of the bones seems complete. The normal arrangement of the trabeculae, however, has not yet been restored.

Increase in the density of the shaft takes place coincidently with changes at the extremity, but more slowly.

Periosteal thickening becomes strikingly apparent and centers of ossification are clearly outlined during the course of treatment.

Consistent results in fifty cases treated lead the authors to regard cod liver oil as a specific in rickets.

The Roentgen Treatment of Morbus Basedowii. Summary of Introductory Address at the Second Congress of the Northern Association for Medical Radiology in Copenhagen, September, 1921. By Joh. Fred. Fischer, M. D., Copenhagen. Acta Radiologica, September, 20, 1921, page 179.

AMONG four hundred and ninety patients treated for goiter there were eleven men. There were two classes of patients, those belonging to the working classes, who were treated at the hospitals, and private out-patients, who for the most part belonged to the well-to-do classes.

The prognosis varies with the two classes, since only the well-to-do are able to take the care necessary in this disease. In four-fifths of the cases a positive result was obtained, complete or partial cessation of symptoms. Recurrences occurred chiefly among the poorer patients. Nervousness decreased rapidly, increase in weight was usual. Perspiration and diarrhoea disappeared, also glycosuria which was observed in three per cent of the cases. In twenty-five per cent the pulse became normal and in fifty per cent it decreased considerably in frequency. Exopthalmia disappeared in several cases.

The usual dose was ten H with three Al. filters on four fields, the one on thymus, but a smaller dose to begin on if the attack had been serious.

Koehler's Disease. By H. Abrahamsen, M. D. Acta Radiologica, September 20, 1921, page 174.

KOEHLER'S DISEASE is an affection of the os naviculare pedis. It appears in children five to six years of age and may be unilateral or bilateral. There is often a history of trauma but none of preceding illness. Pains in the hollow of the sole, a halting gait, soreness on pressure of the os naviculare, slight atrophy of muscles in the lower leg, and often a slight turning inward of the foot to ease the weight on the inner edge are symptomatic. Though symptoms may be fairly characteristic only a roentgen examination can give positive and correct diagnosis. A diminished, condensed ossific center will be found in the os naviculare or the center will be formed in islets and the edges slurred or frayed.

Since Koehler published three cases of this disease (1908) about fifty cases have been reported.

Three views have been advanced as to its pathology. The first view holds that it is of traumatic origin. This is supported by Schultze, Stumme and Hanisch. In many cases there is no history of trauma at all, and in others the trauma is very slight, therefore this view is held a doubtful one.

The second view is held by Preiser, Meulengracht, Mouchet, and Roederer who regard the disease as due to pathologic fracture, though Meulengracht admits that defective formation or de-

velopment may play an important part.

The third view advanced by Koehler is that it is only a question of an anomaly in the development, a dystrophic process. Forssell adopts this view.

Clinical experience leads the author to adopt this last view as his own, though he believes repeated trauma may play a secondary part.

The Early Diagnosis and Treatment of Cancer of the Cervix. By Roland E. Skeel, Los Angeles, Cal. Californit State J. M., November, 1921, p. 438.

AN early diagnosis is rarely made, and much of the responsibility is due to the lay tradition which teaches that menorrhagia is normal at the menopause—and also the ancient belief that cancer must be accompanied by pain, foul discharge and cachexia.

Thirty years experience leads the author to the belief that the misroscope is the proper instrument of diagnosis.

If the general practitioner and the surgeon would coöperate together for early diagnosis the death rate from cancer of the uterus would be markedly reduced.

The author states his decided opposition to unnecessary operations and considers a disgraceful chapter in the history of surgery has been written by the over enthusiastic operators in this field; but he believes in the amputation of every cervix, in parous women beyond the age of child birth, in which there is an unhealed laceration, marked erosion and hypertrophy. He states that he has not as yet the courage to advocate high cautery amputation (followed by radiation) in all pathologically but not clinically diagnosible cases of cancer of the cervix, but he thinks this will come to be the practice.

For hopeless cases, having had experience with all known palliative measures for the past thirty years, he advocates radium as a means of relief. There is not the pain and discomfort with it attendant upon operation and greater relief is experienced from it.

In border line cases the condition and outlook should be presented with the utmost frankness to the patient and her desires then should determine what course will be followed.

Fractures of the Ulnar Styloid. By C. P. G. Wakeley, F. R. C. S., England, Surgical Tutor and Registrar, King's College Hospital. Archives of Radiology and Electrotherapy, October, 1921, p. 150.

FRACTURE of the ulnar styloid occurs very frequently, associated with a Colles' fracture, but seldom occurs as a single fracture. It is owing to the x-ray that these fractures are more frequently seen. Formerly fractures of the styloid process of the ulna and fractures of the carpal scaphoid were doubtless diagnosed as "sprains of the wrist."

All cases of injuries to the wrist should be x-rayed to insure proper diagnosis.

Direct violence is usually the cause of fractures of this type, though in some cases there is history of a twist.

In some cases soon after injury there is some oedema over the lower end of the ulna. Tenderness is not so marked as in the case of fracture of the carpal scaphoid. There is some limitation of dorsiflexion of the wrist. Crepitus does not exist. In late cases the radial styloid process is usually at a lower level than in the other hand.

The hand should be put up for about three weeks on a "cock-up" splint in dorsi-flexion with slight ulnar deviation. After union has been formed massage with the splint in place can be employed for a week after which the splint may be removed.

Descriptions and illustrations are given for three cases.

Injurious Combined Effect of Roentgen Rays or Radium and Topical Remedies. George M. MacKee and George C. Andrews, New York City. J. A. M. A., November 5, 1921, p. 1489.

ON account of the widespread use of the roentgen ray and radium it is important for all physicians to know the effect of topical applications either before or after the use of either. Irradiation, whether or not followed by visible reaction, increases the sensitiveness of the skin. The degree of sensitiveness depends on the injury to the skin. Small or large irradiations followed by topical application may be followed by severe destruction of the skin.

After intensive roentgenization of the skin without reaction, the return to normal will be one month. After a burn of the first degree the skin may react normally in one month after the erythema disappears. This may be two or three months following the treatment. If there is permanent injury the return to normal may not be for months or years.

Fractional irradiation is cumulative in effect. Several fractional doses in one week or less produces an effect much the same as that following one large dose.

Stimulants, irritants and caustics make the skin hypersensitive to irradiation. The degree depends on the amount and strength of topical application. Any drug that is capable of producing a skin inflammation will make the skin more sensitive to irradiation. The remedies most often used and most likely to cause trouble are chrysarobin, scarlet R, iodine, mercury, pyrogallic acid, cantharides, resorcin, beta napthol, tar, iodoform, sulphur, and salicylic acid. In powders they cause the least reaction, in lotions more, and in ointments the greatest.

Caustics, such as sodium hydroxide or potassium hydroxide, acid nitrate of mercury, zinc chloride, tin chloracetic acid, nitric acid, silver nitrate, etc.

Ultra violet light may enhance the effect of roentgen rays and radium.

Great care must be followed in the use of carbon dioxide snow on surface that has been irradiated.

Prolonged applications of heat or cold and friction, especially if combined with liniments, may enhance irradiation effects.

The effect of these combinations is that of a radiodermititis, and the burn may be to the point of first, second and third degree burns.

A physician about to apply topical applications or irradiations should ascertain if any of these remedies have been recently applied.

E. W. R.

Observations on a New Method of Roentgen Ray Therapy in Psoriasis. O. H. Foerster and H. R. Foerster, Milwaukee Arch. Dermatology and Syphilology, November, 1921, pp. 638-659.

THE recent publication of Walter Brock from the Dermatologic Clinic at Kiel, on the treatment of psoriasis by roentgenization of the thymus, warrants the present study as well as investigations of others. The early experimental work showed that irradiation of thyroids, parathyroids, bone marrow and large areas of skin had no effect on the disease. But if the rays were accurately confined to the thymus region the response was an increase or decrease of the disorder. Proper attention to the dose, as well as the other details, leads to the disappearance of the lesions of psoriasis in from one-half to two and one-half months. Brock technique for adults is as follows: Two to four mm. aluminum filter, focus skin distance 20 cm., dose one-half epilation. Children receive one-quarter to one-half epilation doses. At first the dose may stimulate and temporarily make the disease worse. It improves, however, as the thymus is affected further. The portal of entry is bounded above by the lower border of the larynx and upper border of the clavicle, at the sides by the parasternal lines, and below by the fifth intercostal spaces. The complete adult dose is about 10 X.

An explanation for the action of the treatment is based on the assertion that hypofunction of the thymus is associated with psoriasis. Overstimulation arrests this condition. This presupposes the presence of functionating tissue throughout life. This theory is supported by the pathologic research of Hassall, Hammer and Hart. The thymus is known to be very radiosensitive. There is at first retrogression followed by regeneration and a supposed increase in activity.

In early youth, when the thymus is naturally very active, psoriasis is very uncommon.

The researches of others—Samberger, Sallhof, Peterson and Stephon—go to show that roentgenization of the organs of internal secretion stimulates them to action.

The present report covers twenty-three patients extending over a period of five months. No other treatment was employed. The cases were all ambulatory. The technique adopted was as follows: Spark gap, eight and one-half inches; ten-inch distance; three mm. aluminum filter, five milliamperes, two minutes and forty-two seconds. After a few days in which the symptoms were aggravated, the lesions gradually disappeared. Eleven patients received two doses after two months, and two received a third.

In thirteen of the twenty-three cases the condition was at least markedly improved. In eight everything cleared up except a roughness on the elbows

and knees. In five the eruption disappeared entirely.

In patients showing recurrences the lesions were milder than the original. There was less response to treatment of recurrences than the first. Recurrences were stubborn in response to local treatment also.

These results show that the method is more convenient to the patient and that there is a response to thymus therapy. Though the number of cases treated is small, yet it is sufficient to justify this method as practical.

E. W. R.

A Comparative Study of the Pathology and X-Ray Densities of Tuberculous Lung Lesions. H. Kennon Dunham and John H. Skoolem. American Review of Tuberculosis, Vol. V., No. 4, June, 1921.

THIS study of abnormal lung densities has been limited largely to the normal and tuberculous lung tissue. Further studies are advised and give great reward for the search. This experience shows that normal lung tissue can be accurately determined. Normal lung tissue casts but slight shadows and enhances the ease of determining pathological tissue.

Perivascular and peribronchial thickening are common words in medical literature. This study is partly to determine if they have a sound basis in pathology. It is found that neither term means tuberculosis unless peribronchial and perivascular thickening begins in fans in the periphery of the lungs. In this study it was never found unless the two pathological lesions were together.

The greatest advantage of an x-ray study is that it reveals pathology in the living subject. The character and development of the lesions can be followed through this development.

Etiology is deduced by considering the whole lung field. Prognosis is not so accurate as diagnosis.

Plates should be studied before the clinical history and physical examination are known. It is dangerous to read plates in the light of clinical history, for the tendency to read into a plate the physical findings is very great.

All over the country eminent roentgenologists are reading plates with different conclusions. The knowledge should be further standardized and correlated in order to arrive at a standard interpretation of x-ray chest plates.

X-ray diagnosis should not be accepted blindly by the clinician. It should only be used in conjunction with other laboratory findings to interpret and correct physical signs. Following cases to post mortem will check up all the methods employed.

Dunham has recently published a classification of x-ray findings of pulmonary tuberculosis. This has been used as the basis in more than five thousand cases studied at the U. S. A. General Hospital No. 19, where nearly one hundred and fifty cases came to autopsy. Further, one hundred and forty-six were studied at the Cincinnati Tuberculosis Sanatorium in 1920, with seventy-three autopsies.

1. Adult Tuberculosis—Synonyms: Secondary tuberculosis, nodose tuberculosis, apical tuberculosis, chronic tuberculosis, tuberculosis in the sensitized patient.

(a) Apical fibroid tuberculosis. Earliest findings localized tuberculous pneumonia; if lesion extends, chronic fibroid tuberculosis develops.

(b) Gelatinous and caseous bronchopneumonia (with apical lesions).

(c) Lobar caseous pneumonia (with apical lesions).

(d) Fibrous pleurisy; pleural exudate.

2. Puerile or primitive tuberculous nodules. Synonyms: childhood tuberculosis, tuberculosis in non-sensitized patient, focal tuberculosis.

(a) Primary lesion and tuberculous nodes.

(b) Miliary tuberculosis.

(c) Basal tuberculosis.

(d) Tuberculous caseous broncho and lobar pneumonia (without apical lesions).

(e) Caseous pleurisy.

These various types are fully illustrated by the records of over twenty cases. The records cover the reading of the x-ray plates and the gross and microscopic pathology. They seem to fully carry out the deductions of the author as given in his summary. An accurate piece of research of great value is offered to the literature.

E. W. R.

Tuberculosis in Discharged Soldiers. Miles J. Breuer, Lincoln, Nebraska. American Review of Tuberculosis, October, 1921.

THIS is an interesting review of the diagnosis of pulmonary tuberculosis by an internist. The class of patients is of interest in as much as all of them are discharged soldiers, of, presumably, early adult life. The clinical findings are arranged in valuable sequence in a manner not usually grouped, yet comprehensive. The arrangement is as follows:

Toxic Symptoms—
- Weakness and early fatigue.
- Poor appetite.
- Afternoon temperature, etc.

Reflex Symptoms and Signs—
- Hoarseness and cough.
- Frequent colds.
- Gastro-intestinal symptoms, etc.

Local Symptoms and Signs—
- Hemoptysis.
- Pleurisy.
- Cough with expectoration, etc.

Specific Signs—
- Tubercle in sputum.
- X-ray.

The diagnosis was made on the basis of the presence of important signs and symptoms belonging to toxic, reflex and local group. The presence of the specific group was not considered essential. If the diagnosis could be checked up by specific signs it becomes that much more certain. However, when specific signs are present, the process is already advanced. It was the purpose of the author to make a diagnosis before such advanced stage was reached.

Total number examined, eight hundred; total number diagnosed tuberculous, fifty-eight; cases analyzed, fifty.

X-ray examinations of the chest, twenty-one cases.

The percentages which follow are based on the number of cases in which both physical and x-ray examinations were made.

	No. Cases	Per Cent
Physical and x-ray diagnosis agreed exactly	15	71
Active by physical and inactive by x-ray	4	19
Agreed on positive diagnosis without reference to activity	19	90
Active by physical and negative by x-ray	2	9
Active by x-ray and negative by physical	0	0
Tubercle bacilli found in sputum	8	16
	8	16
Sputum negative for tubercle bacilli	19	38
No sputum	23	46
Tuberculosis indicated by sputum, not by physical examination	0	0

The verdict arrived at by physical diagnosis is not made up of sharp distinctions. The same is true of the x-ray diagnosis. A case pronounced negative by x-ray and positive by physical examination may be interpreted in any of the following ways: "Roentgenologist failed to find or interpret signs actually present on the plate; internist too enthusiastic; both off the track; or, as in this case, physical signs . . . . . may appear before the pathological process in the lungs is sufficiently advanced to produce any change in the x-ray shadows. It will be noticed that the converse failure to find physical signs in a case pronounced positive by x-ray has not occurred in this series."

E. W. R.

Diathermy—Its Production and Uses in Medicine and Surgery. By Elkin P. Cumberbatch, M. A., B. M. (Oxon), M. R. C. P., Medical Officer in Charge, Electrical Department, St. Bartholomew's Hospital; Vice-President, Section of Electrotherapeutics, Royal Society of Medicine. Publishers, C. V. Mosby Company, 801-809 Metropolitan Bldg., St. Louis, Mo. Price, $6.00.

THIS is a book of 189 pages, duodecimo size. There are forty-four illustrations, including some twelve diagrams, and fifteen plates.

The style is admirably simple and clear with all necessary but no tiresome detail included.

A clear idea is given of just what is meant by the term "diathermy." The nature of the current and the principle upon which it is produced is taken up and a historical sketch of the high frequency current is included here.

The parts and workings of the diathermy machine are explained in detail with the aid of diagrams. Descriptions and illustrations of the different makes are given with notes concerning their proper care.

A general explanation of the physiological effect is given and effects on the cardio-vascular system and the respiratory exchange are given in some detail.

This takes up about a third of the text and the next third deals with medical diathermy, which is first defined.

Methods and technique of applying the current are given and maladies and conditions for which diathermy has been found useful are recounted.

Case histories for the following are in this section: cases of subnormal temperature, neuritis, sciatica, arteriosclerosis, haemorrhoids and gonococcal infections.

The last seventy pages are devoted to the surgical uses of diathermy. Diathermic cauterization is described and distinguished from other methods of cauterization. The principles of this method are given and the electrodes used are described and illustrated.

Directions for experimental cauterization of muscle and liver tissue are given and the author recommends that these experiments be tried by prospective operators.

The method of treating malignant growths by diathermy is taken up under the following heads:

1. Anesthetic.
2. Choice of electrode.
3. Position of indifferent electrode.
4. Regulation of current.
5. Cauterization.
6. Bladder growths.
7. Tissues to be avoided.
8. Risks.
9. Effects.
10. Complications.
11. Sepsis.
12. Prolongation of life.

Particulars are given in several cases of the following nature: growths of the mouth and throat, inoperable carcinoma of the breast, growths of the female genitalia, rodent ulcer, non-malignant growths, other forms of morbid growths.

The Roentgen Diagnosis of Diseases of the Alimentary Canal. By Russell D. Carman, M. D., Head of Section of Roentgenology in the Division of Medicine, Mayo Clinic, and Professor of Roentgenology (Mayo Foundation) Graduate School of Medicine, University of Minnesota. Second Edition Thoroughly Revised. Octavo of 676 pages, with 626 original illustrations. Philadelphia and London. W. B. Saunders Company, 1920. Cloth, $8.50 net.

THIS is a revision and enlargment of the earlier (1917) edition by Drs. Carman and Miller. The helpful and copious illustrations of the first edition have been increased by one hundred and twenty-two new ones and the list of protocols has likewise been added to. A new chapter on the hour glass stomach, and also a chapter on pneumoperitoneal diagnosis of abdominal lesions has been written.

The subject is treated in a broad way, such as might be expected from one of the author's experience and environment, but no smallest detail of aid to the diagnostician of more limited opportunities has been overlooked. The book offers sane and common sense suggestions throughout. Criteria for operable and inoperable cases are given and no opportunity is lost to elucidate points that may easily be obscure to many practitioners As before, the effort is maintained to collect the well established facts and arrange the records in a systematic manner.

A short space is devoted to apparatus and general technique. Emphasis is laid on the fact that the screen and plate are indispensable complements and that records should be systematically made and kept. Interpretation is next dealt with, and it is noted that industry, experience, judgment and care, not genius, are the requisites. Correlation and coöperation in diagnosis are stressed.

In taking up the different parts of the alimentary tract, the anatomy, the normal and pathological appearances are discussed first, and the technique of examination fully described. The relation of bodily build to visceral form and position is kept before the attention.

Eight chapters, about two hundred pages, are given to the discussion of the pathology of the stomach in the following sequence: gastrospasm, cancer, fibromatosis, syphilis, benign tumors, ulcer, hour-glass stomach, and miscellaneous gastric conditions.

A short chapter on the stomach of infants and children quotes the opinions of numerous authorities interspersed with the author's own.

Another chapter on the stomach after operation states what, so far as it is possible to give, are the criteria for normalcy. Jejunal and gastro-jejunal ulcers are described, recurrence is discussed.

Gall-stones, the gall-bladder, the liver, the small intestine followed by a chapter on duodenal ulcer and one on miscellaneous lesions of the small intestine, the large intestine and its pathology are treated at length. A chapter is given to chronic intestinal stasis and one to chronic appendicitis.

The references to the literature are given at the end of each chapter and a bibliographic index as well as a comprehensive general index is appended.

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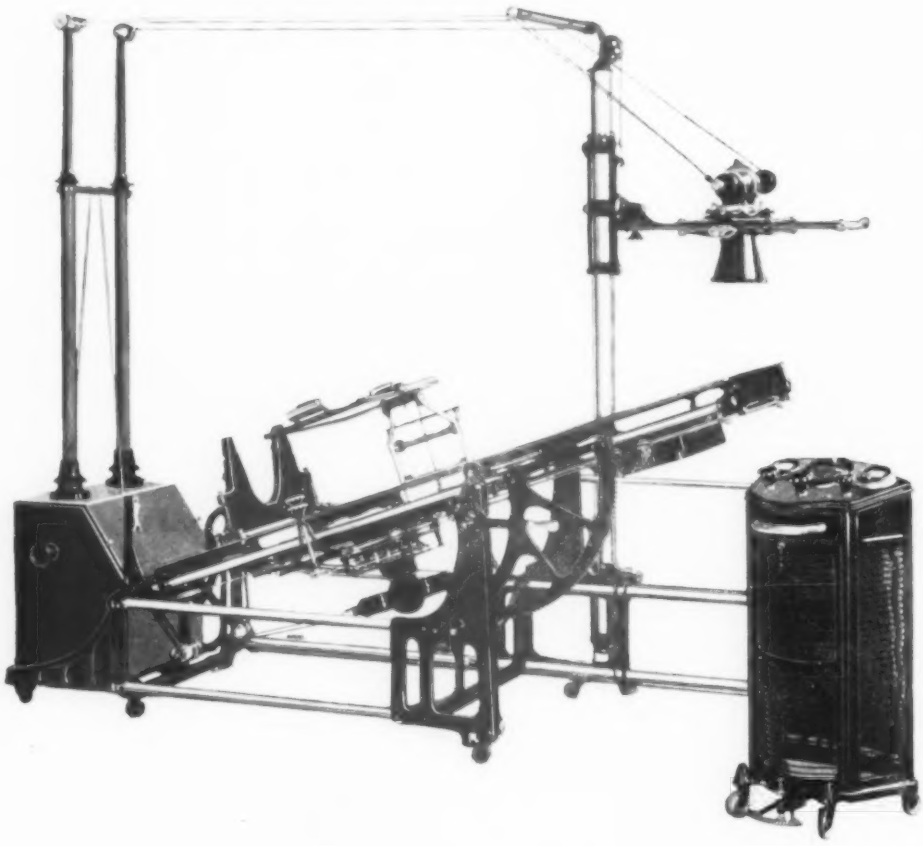

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